ELECTRICAL REVIEW 29 AUGUST 1958

TECHNOLOGY DEPT.

200 MW TURBO-GENERATOR

ELECTRICAL REVIEW

FRIDAY
29 AUGUST 1958

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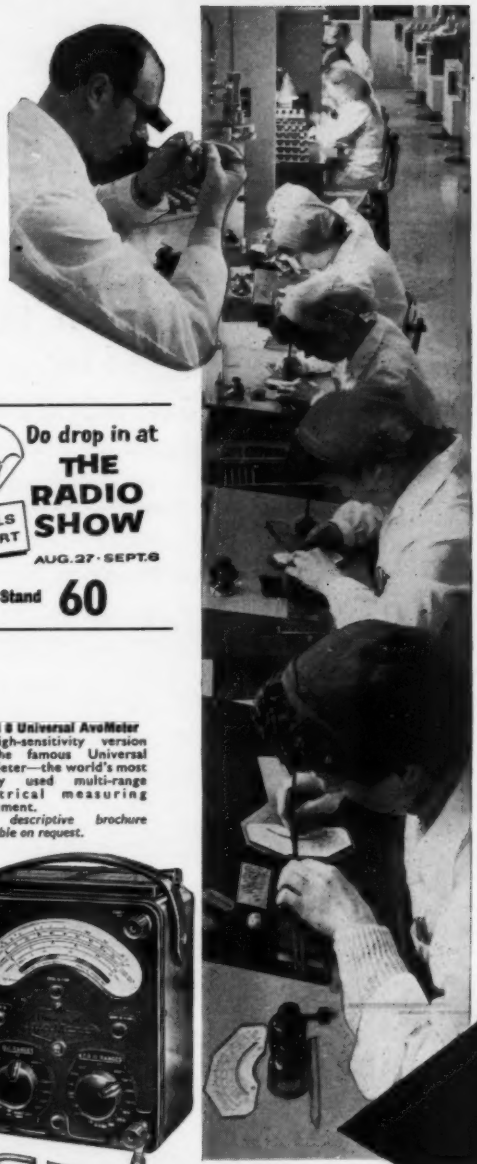

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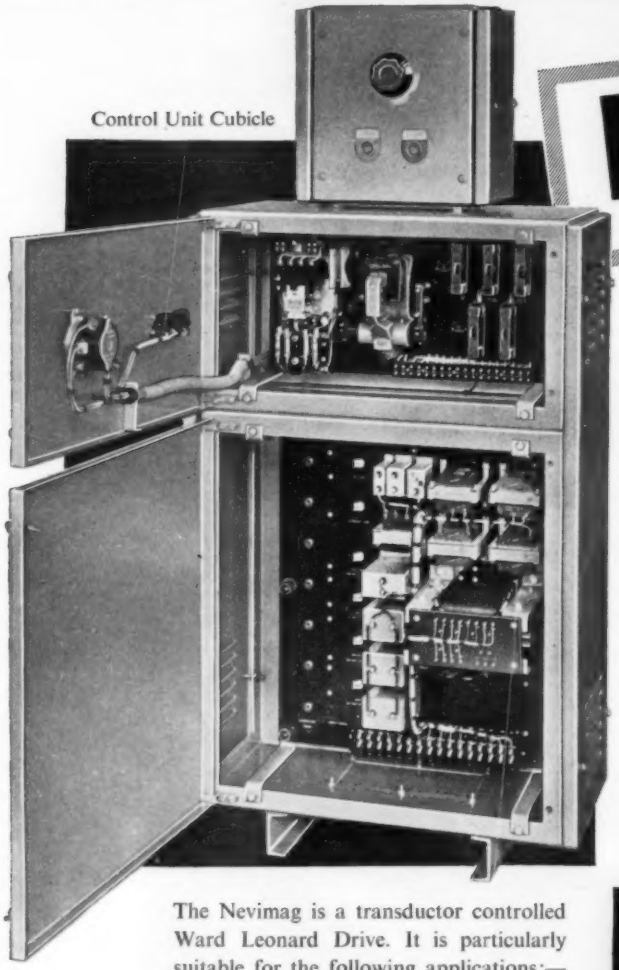

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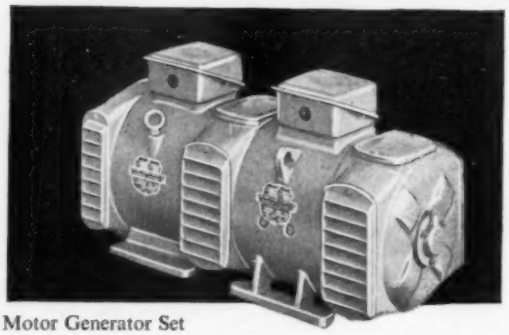

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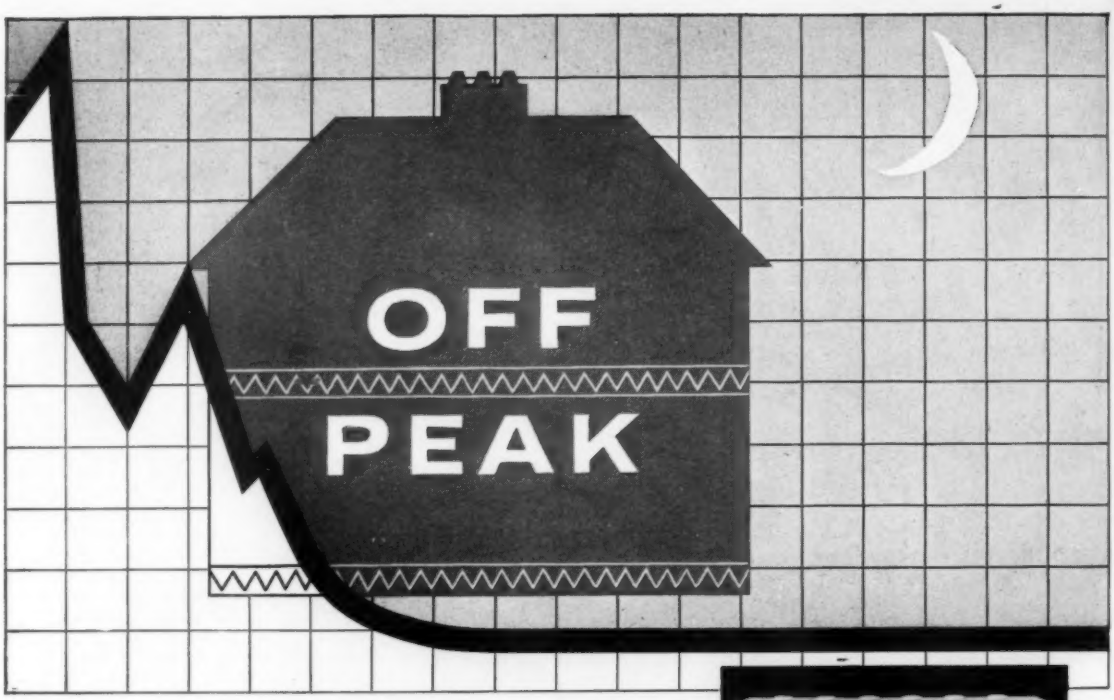
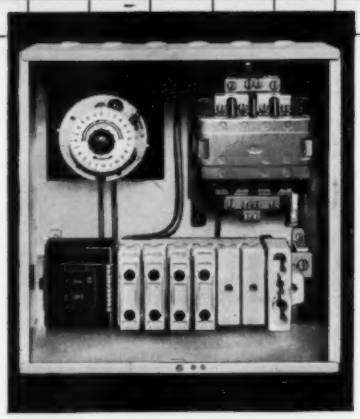


Under-floor heating and other off peak loads need these MEM Consumer's Control Units

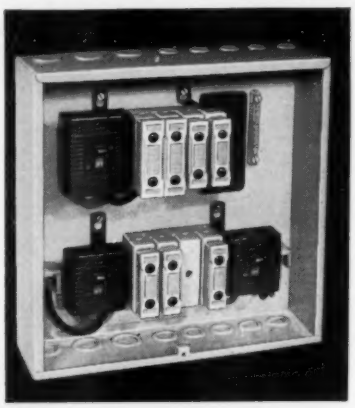
Here is the MEM answer to the off peak load problem. The unit 2FHC/R on the right is designed for control of night load only, for those installations where the day load is already controlled and protected by separate control equipment. The unit comprises a mild sheet steel case 12" x 12" x 5", finished Ivory enamel. The front cover is sealable. The control unit contains a "MEM-AC" 60 amp. 250v. double pole main switch, and a time switch, which operates the 60 amp. single pole, 250 volt, 50 cycle "AUTOLINE" contactor.

The under-floor heating or storage heaters and water heater circuits are protected by 6-15 amp. "MEMCERT" S.P. & N. fuses.

The unit 3FHC/R illustrated below is designed to operate as a central control for the normal day load comprising lighting, power plugs, etc. In addition, within the same enclosure, main switches and circuit fuses are fitted for the control and protection of under-floor heating circuits, storage heaters, etc. Where desired, control units can be provided with time switch and "AUTOLINE" contactor for timed automatic control of the night load.



2FHC/R



3FHC/R

Prices can be quoted for Control Units to customers' own specifications.

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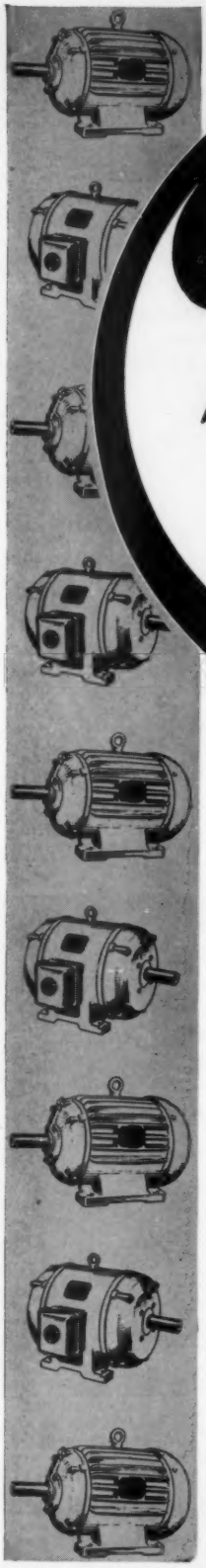

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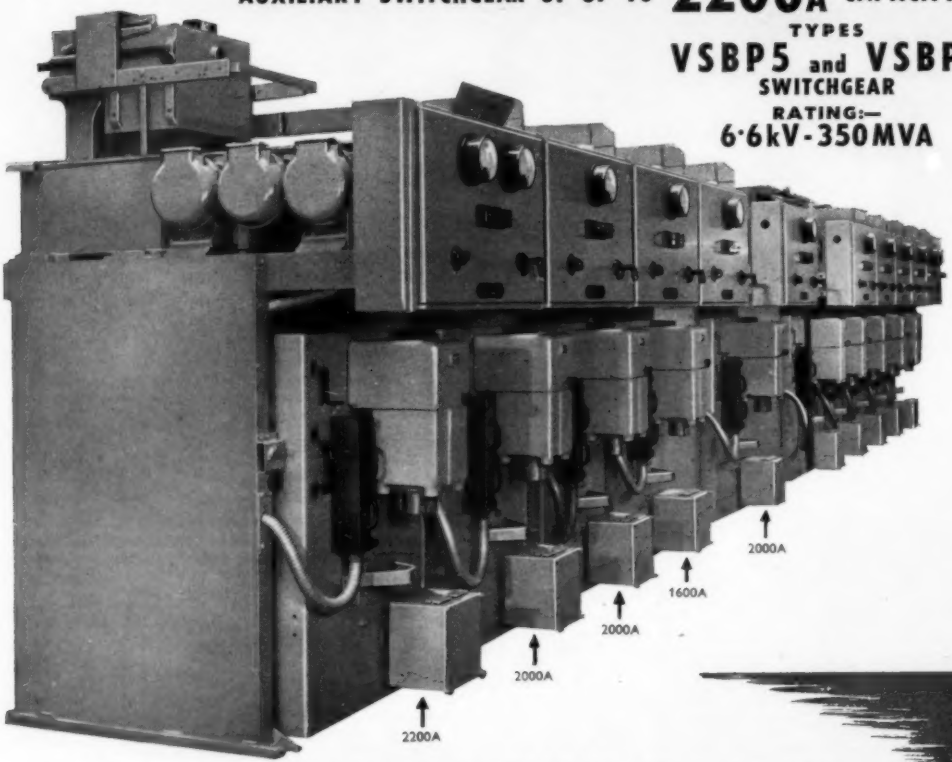

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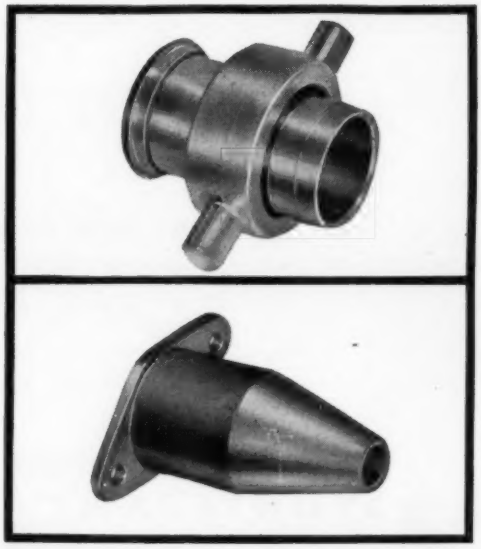

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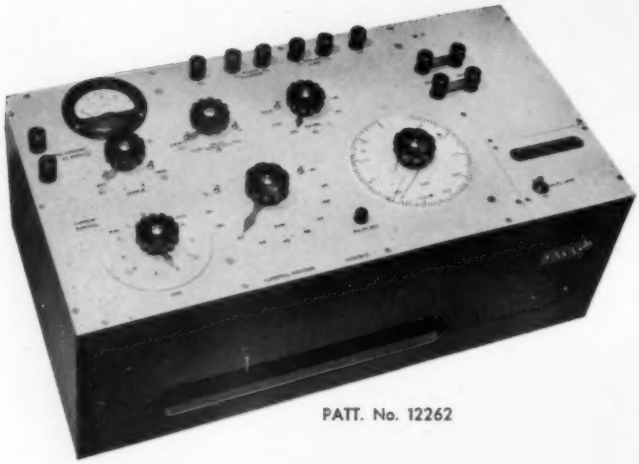

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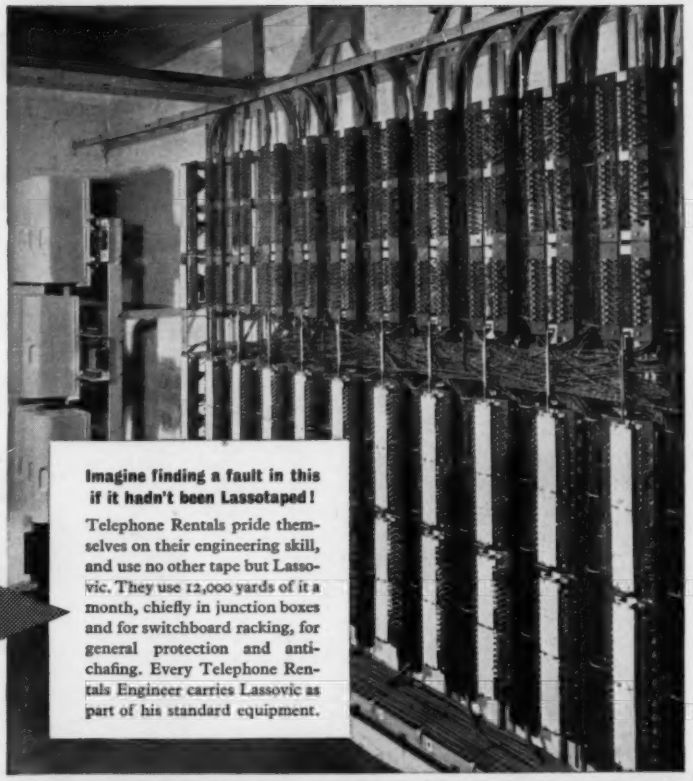

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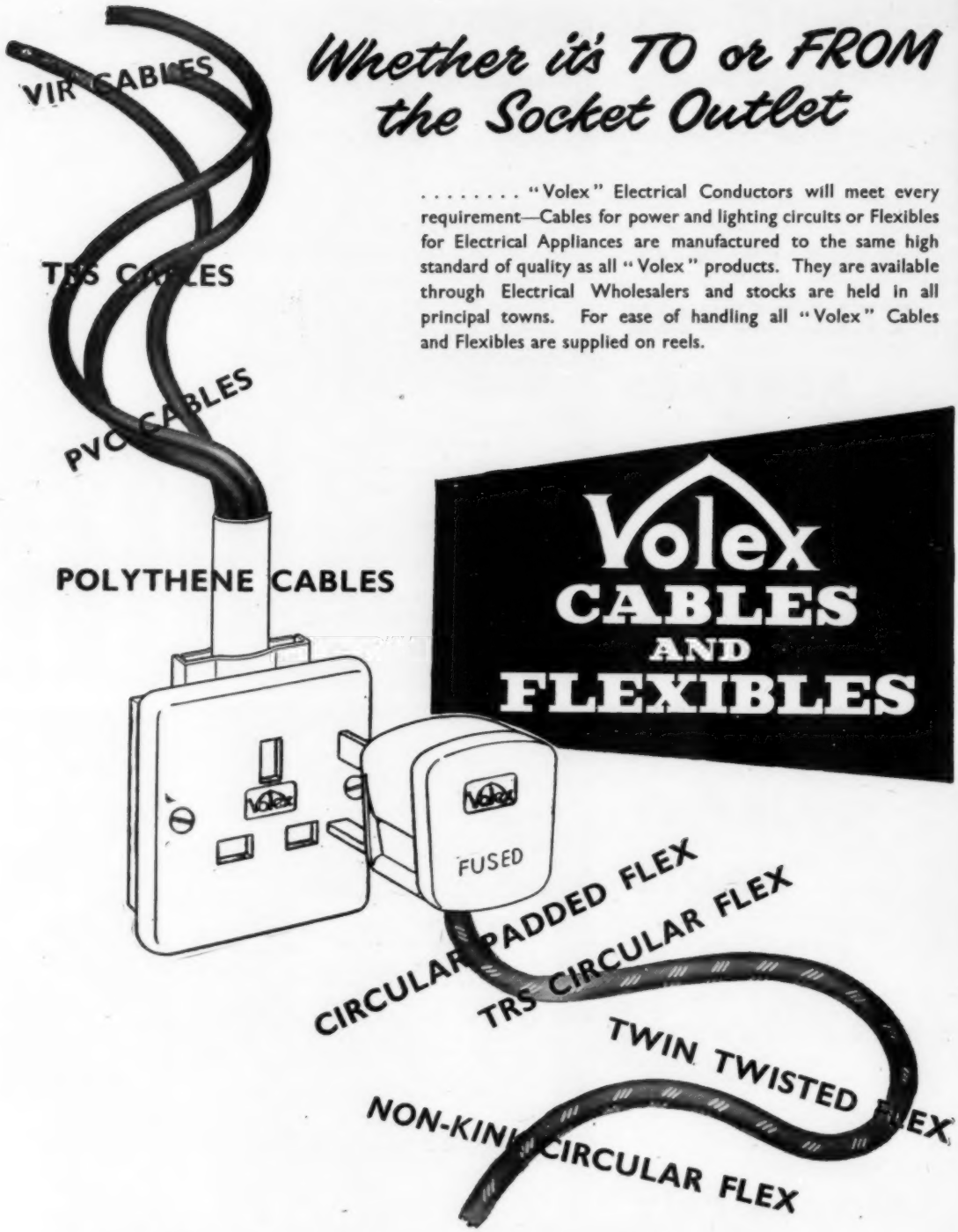

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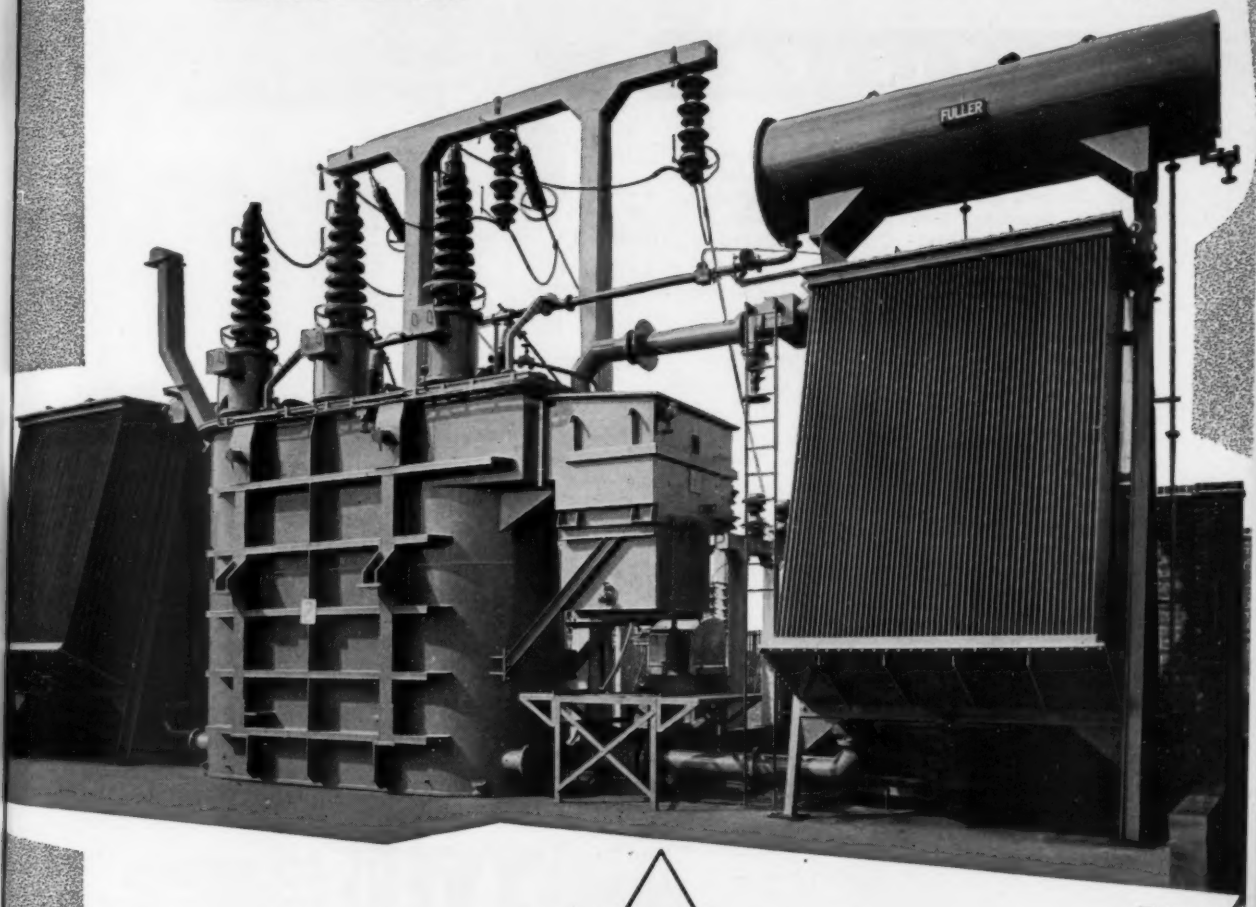

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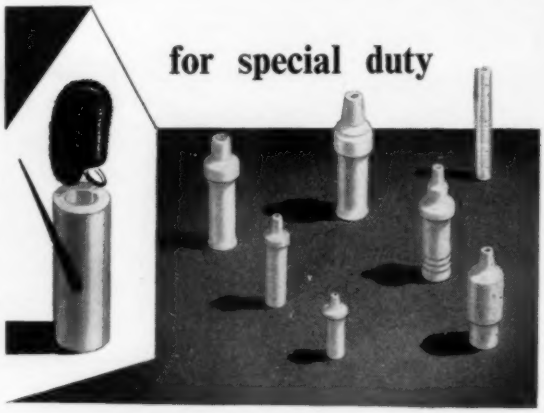

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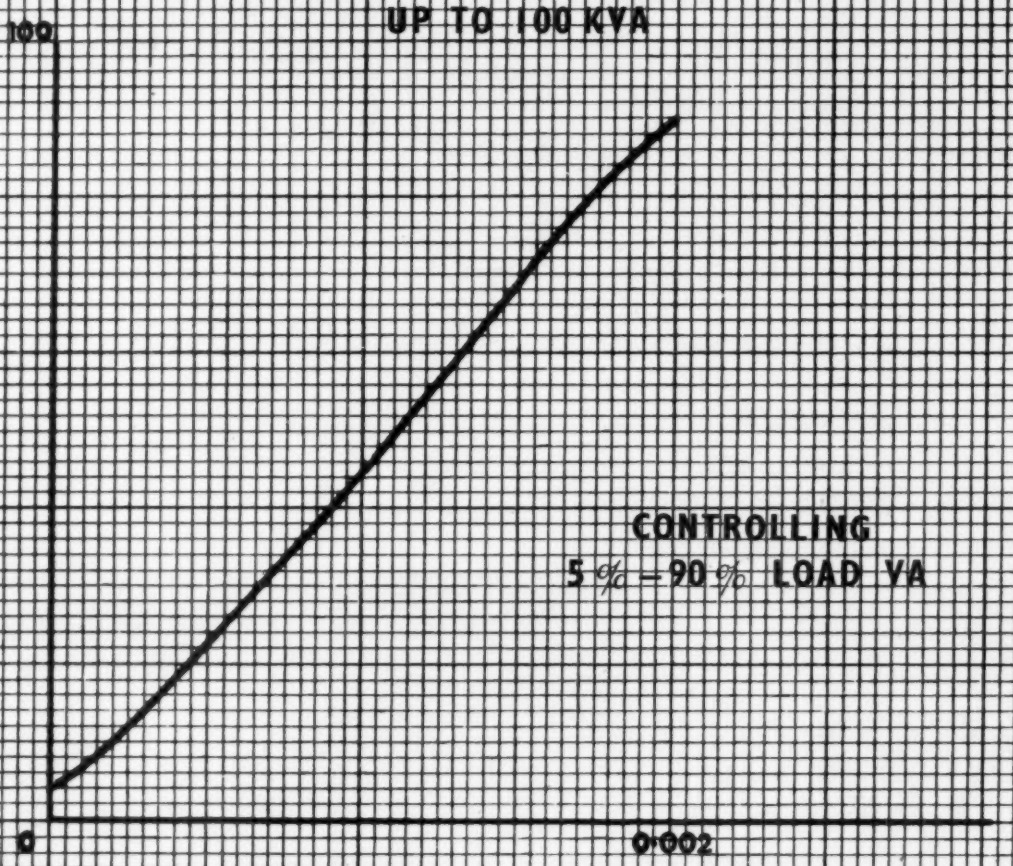

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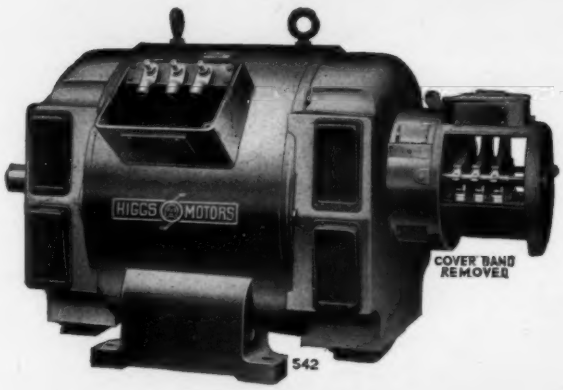

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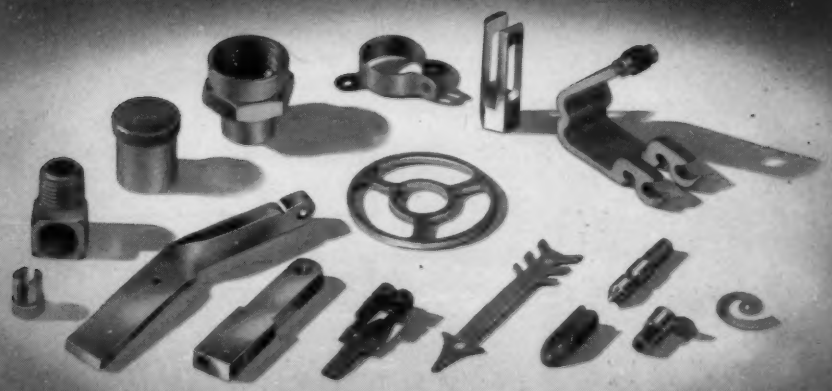

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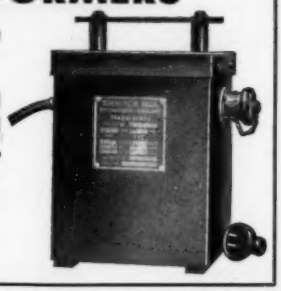

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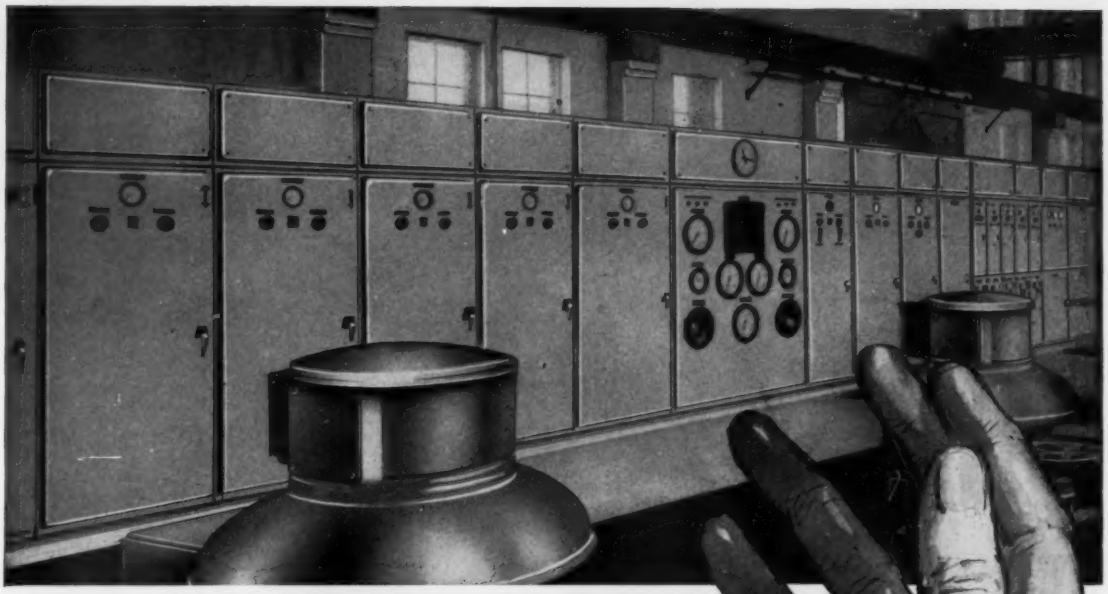

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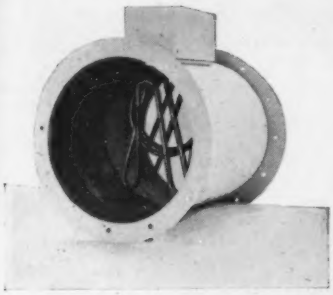

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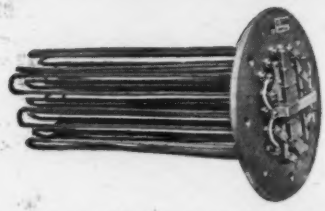

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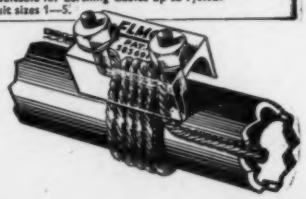
A COMPLETE RANGE TO B.S.951. 1948 IN 4 SIZES

	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes i.e. in trade terms	1, 2 & 3 ⅜" to ¾"	4 & 5 1" and 1¼"	6 & 7 1½" and 2"	8, 9 & 10 2½" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.



"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

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Flexible-to-rigid CONDUIT COUPLINGS

Made in zinc base alloy in the following sizes

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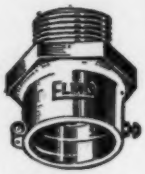
Electric Thread (Male)		⅜"	½"	1"	1¼"	
Inside Diameter Flexible Conduit		⅜"	½"	¾"	1"	



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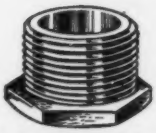
Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal threads suit all makes of flexible tubing.



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Made in the following sizes:

MALE: Electric Thread
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For fluorescent lamps and overhead lighting fittings. Screwed ⅜" thread, male electric.

Made to fit all standard boxes with two holes 7/32" diameter — 2" centres diametrically opposed. Designed in accordance with British Standard Specification.

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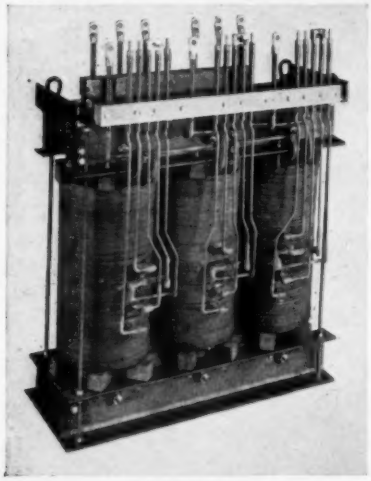

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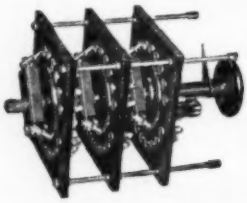

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Also Type O without interlock and Type C for on load switching

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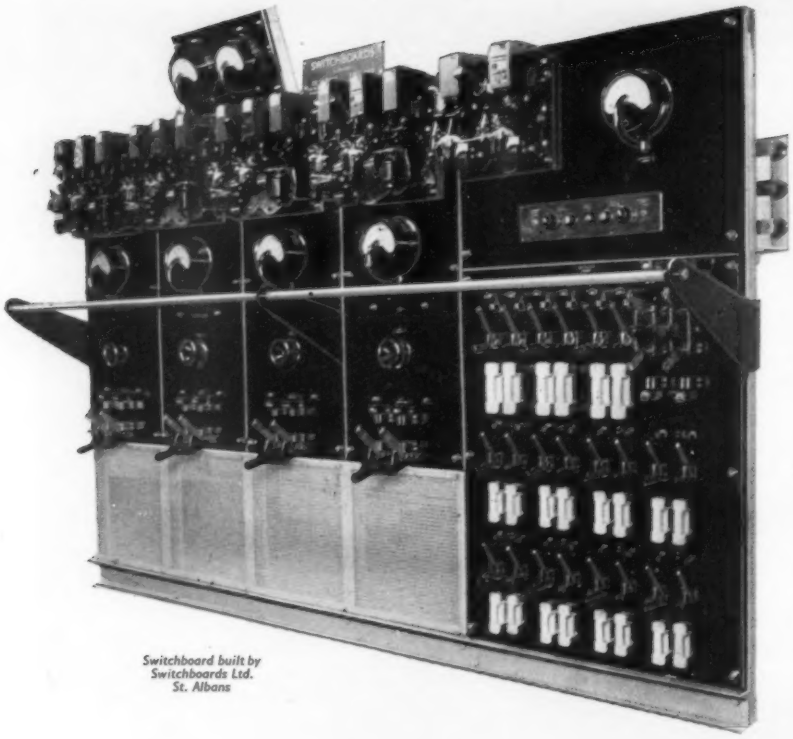

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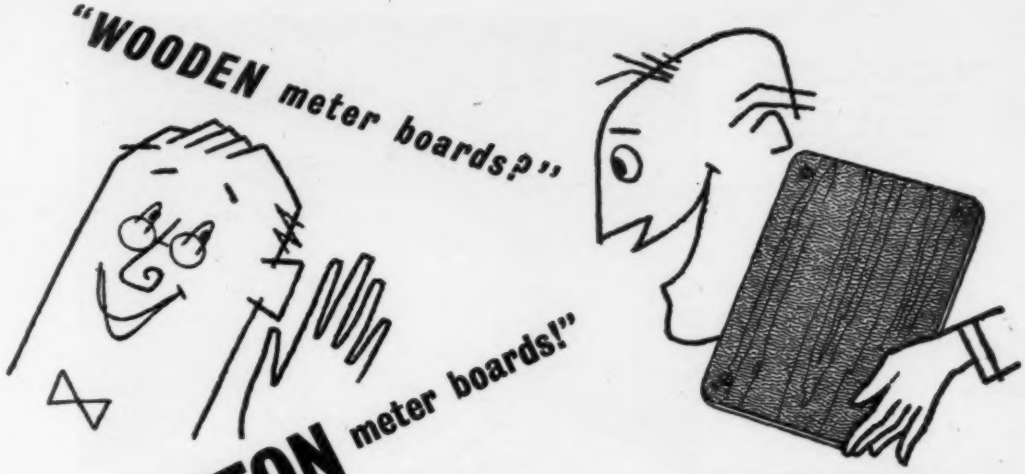

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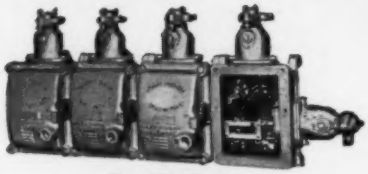
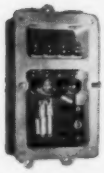


Type FS 15 amp Triple Pole Distribution Board with Core Balance Earth Leakage Protection

Flame Proof Annunciator Type P.3



Flame Proof Push-Button Type P.2

Remote Control Switch

Flame Proof Limit Switch

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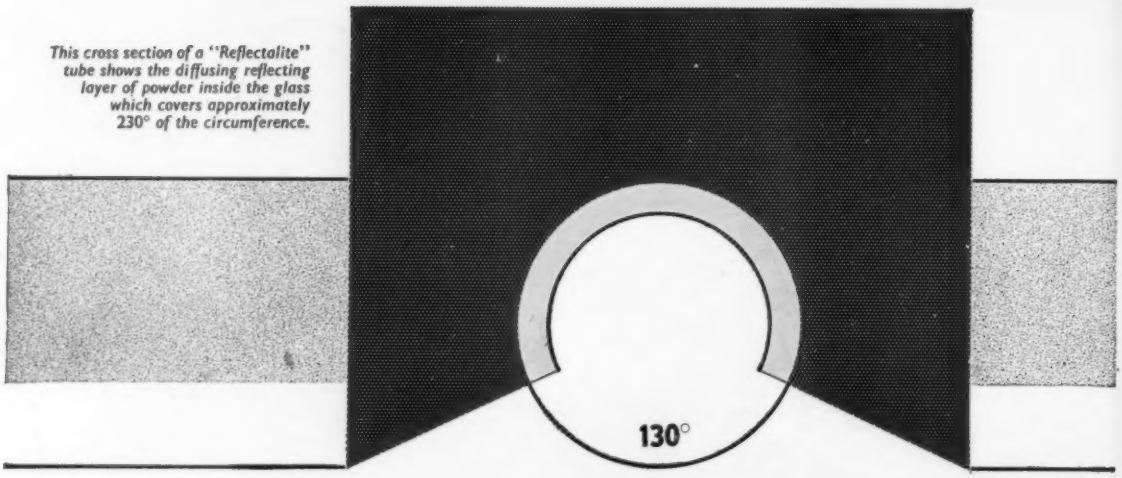
Smee's S.89

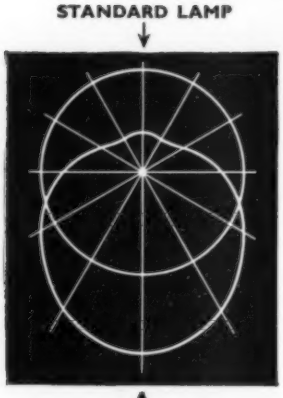


This cross section of a "Reflectalite" tube shows the diffusing reflecting layer of powder inside the glass which covers approximately 230° of the circumference.

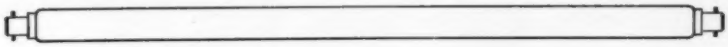
Last year, an instantaneous and widespread success

This year PHILIPS Reflectalite

Here's news about PHILIPS "Reflectalite", the fluorescent tube with the built-in reflector. This year the light output of "Reflectalite" has been increased even further. For example, the 40w. Cool White tube now has 10% greater efficiency – so the "Reflectalite" sales appeal is now even stronger than before. This extra-effective sales story will be put across in powerful leaflets and advertisements. When your customers see them, sales are going to rise even higher – and so will *your profits!*



Light distribution comparison diagram.



Almost two-thirds of every "Reflectalite" tube is internally coated with a special powder prior to the application of the normal fluorescent phosphor. Thus the major part of the light output is reflected through the 130° 'window' *where it has maximum effect.*

REFLECTALITE 4′ 40w. and 5′ 80w. lamps are available for use on Switch-start or Instant-start apparatus in Warm White, Cool White and Cool White de Luxe colours. All 80w. tubes obtainable with B.C. or Bi-Pin caps.

LIST PRICES: **Switch-start 4′ 40 w. 13/9 plus P.T.**
5′ 80 w. B.C. or Bi-Pin 14/9 plus P.T.
Instant-start lamps 1/- extra.

has even more to offer!

This year you'll have

EVEN GREATER OPPORTUNITIES

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PHILIPS

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FLUORESCENT
REFLECTOR
TUBE

now with ***INCREASED EFFICIENCY!***

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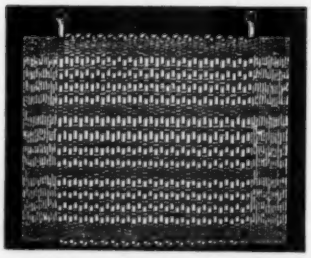

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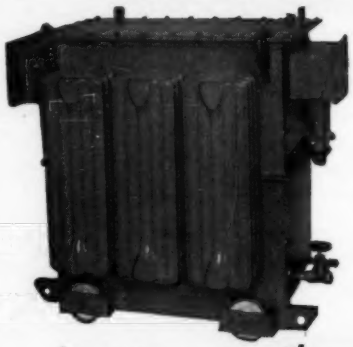
It's a **STURDY** *transformer . .*



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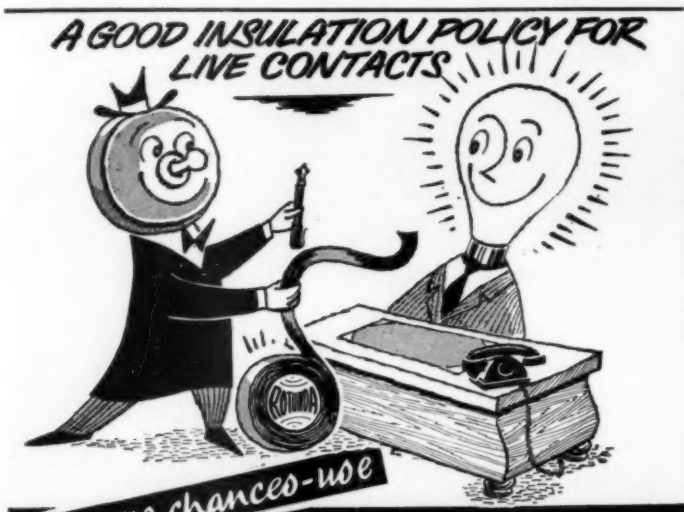

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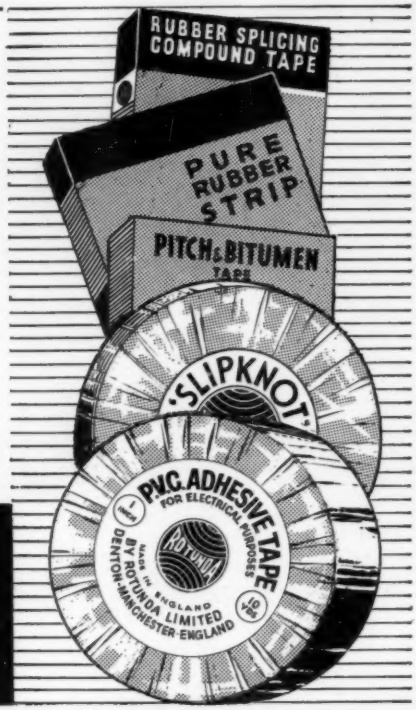

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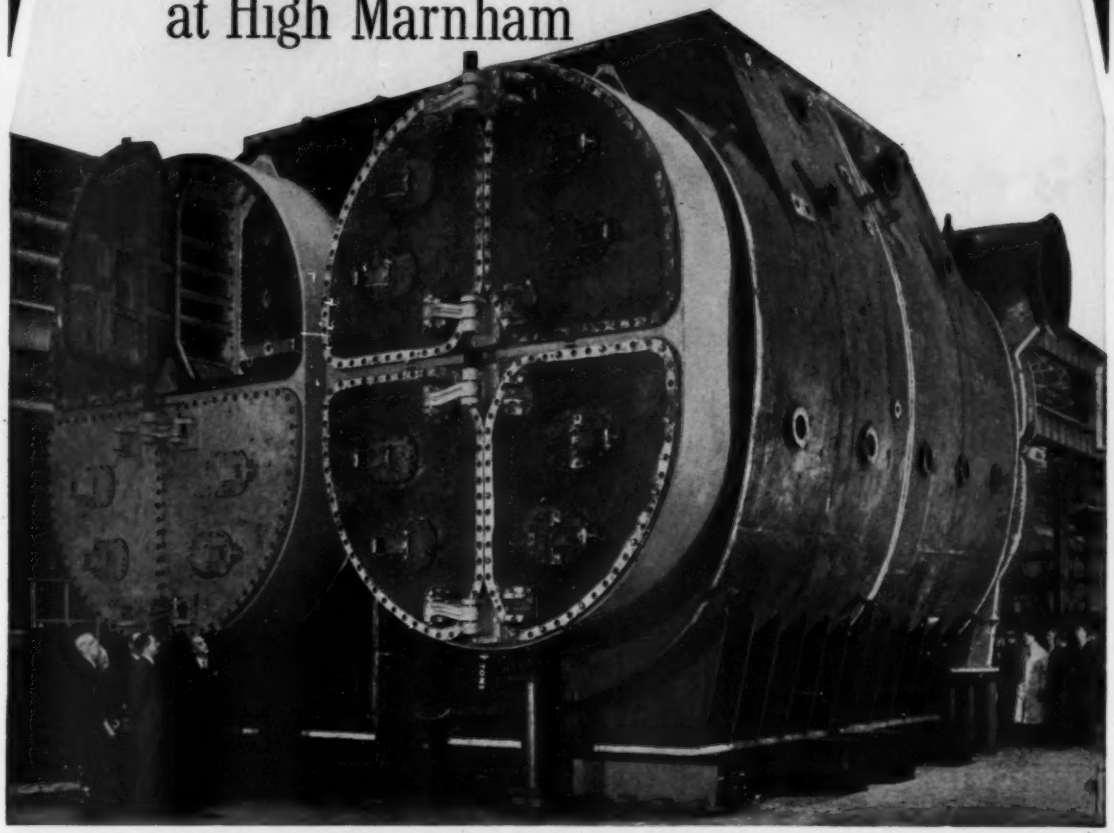
at High Marnham



The condenser for the first of the five 200 MW steam turbo-alternator sets to be manufactured by 'ENGLISH ELECTRIC', which contains 83 miles of tubes and is designed to deal with 400 tons of steam per hour, being assembled at one of the Company's works. When completed the 1,000 MW power station at High Marnham will be the largest generating station in Europe.

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steam turbo-alternator sets

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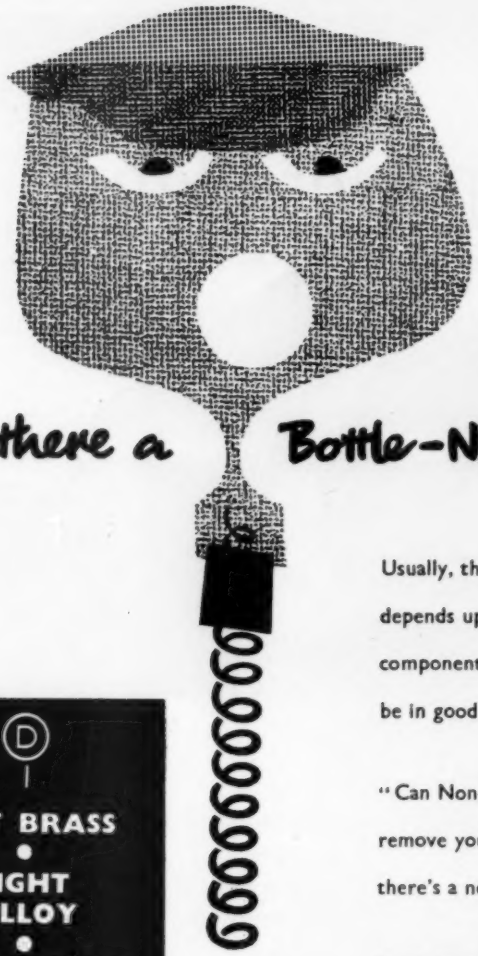

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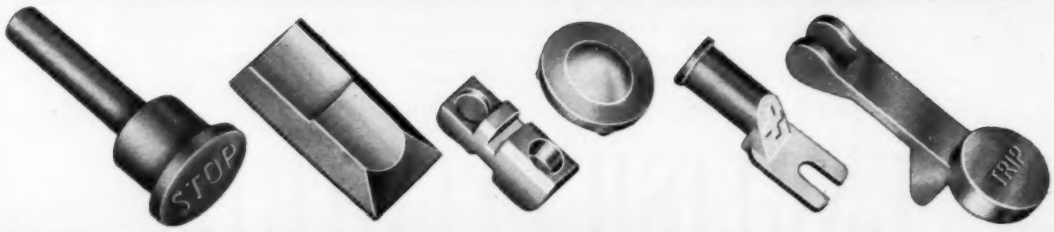

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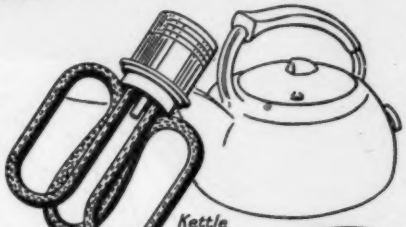
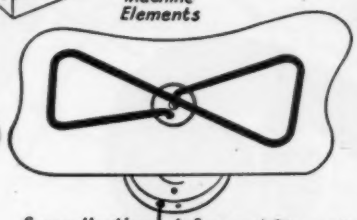
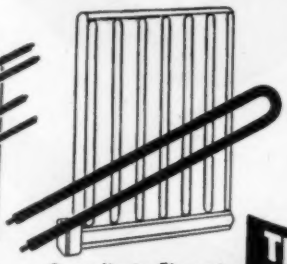

Kettle Elements

Fan Heating Elements


Space Heating Infra-red Elements

Water Heater Elements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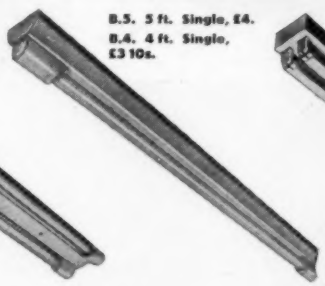
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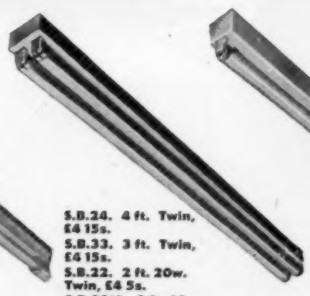
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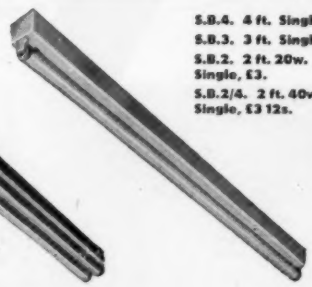
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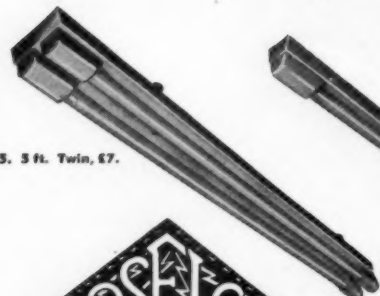
S.B.25. 5 ft. Twin, £7.

S.B.5. 5 ft. Single, £4 4s.

S.25. 5 ft. Twin, £8 2s. 6d.
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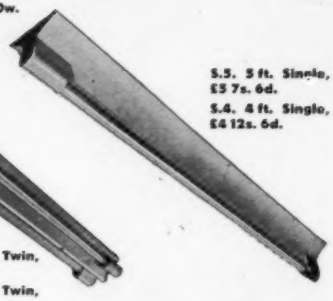
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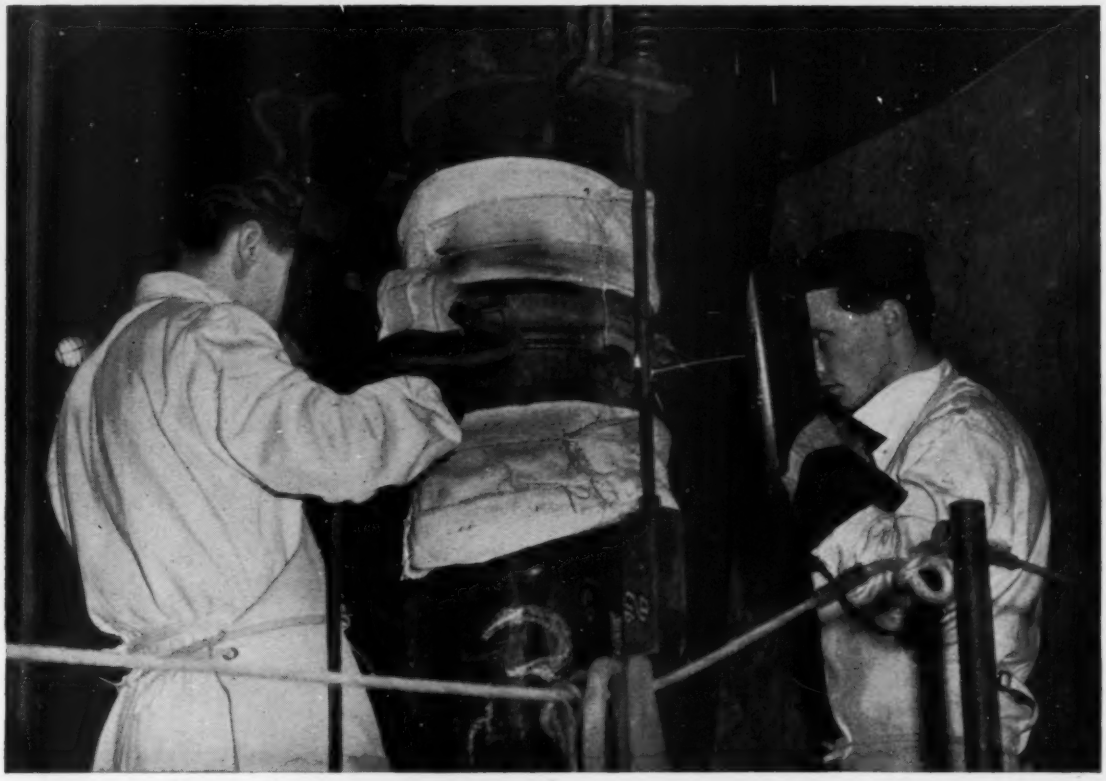

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200 MW reheat boiler units

Erection of the pressure parts is now well under way. The photograph shows the site welding of one of the downcomers, an integral part of the Controlled Circulation system adopted for these advanced units.

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OPERATING CONDITIONS

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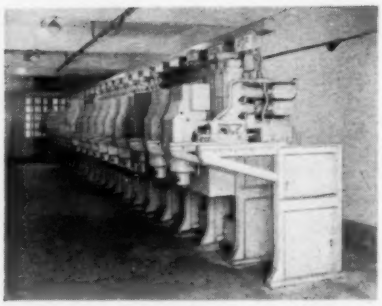
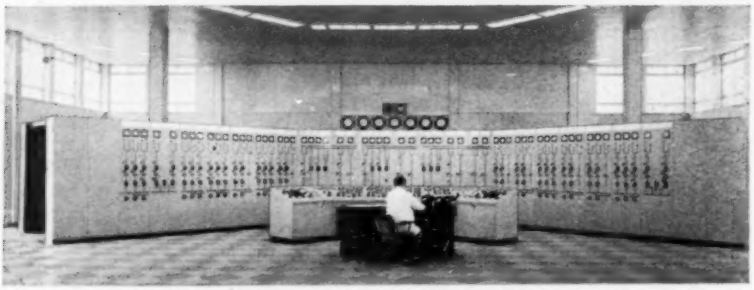
REYROLLE SWITCHGEAR

LLANDARCY OIL REFINERY

The illustrations show some of the 11-kV 350-MVA switchgear and the corridor-type control-board supplied by Reyrolle to Llandarcy Oil Refinery

Consulting Engineers
Ewbank & Partners





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"Construction of the Repeaters on both sides of the Atlantic, aimed at achieving as near perfection as humanly possible: if one of them fails, communication will stop . . ."

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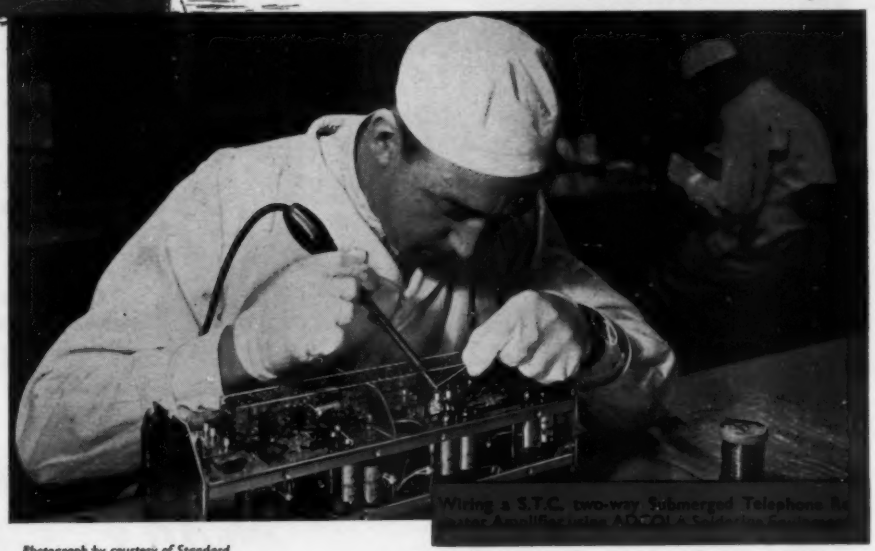

Wiring a S.T.C. two-way Submerged Telephone Repeater Amplifier using ADCOLA Soldering Equipment

Photograph by courtesy of Standard Telephones and Cables Ltd.

Covered by British, Foreign Pats. and Reg. Designs, etc. Complying with leading countries' electrical standards.

THE 16 Submerged Repeaters in the Transatlantic Telephone submarine cable section between Newfoundland and Nova Scotia had to be built to withstand the rigours of laying and water pressure at depths of up to 250 fathoms under the Atlantic, with components of such fidelity as to last many years without attention.

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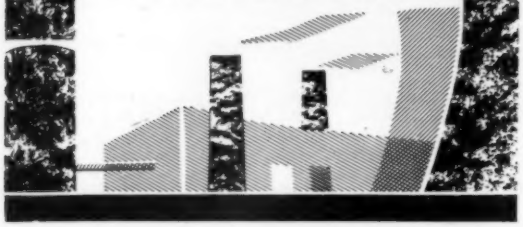

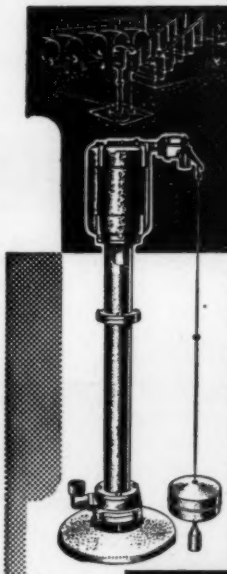

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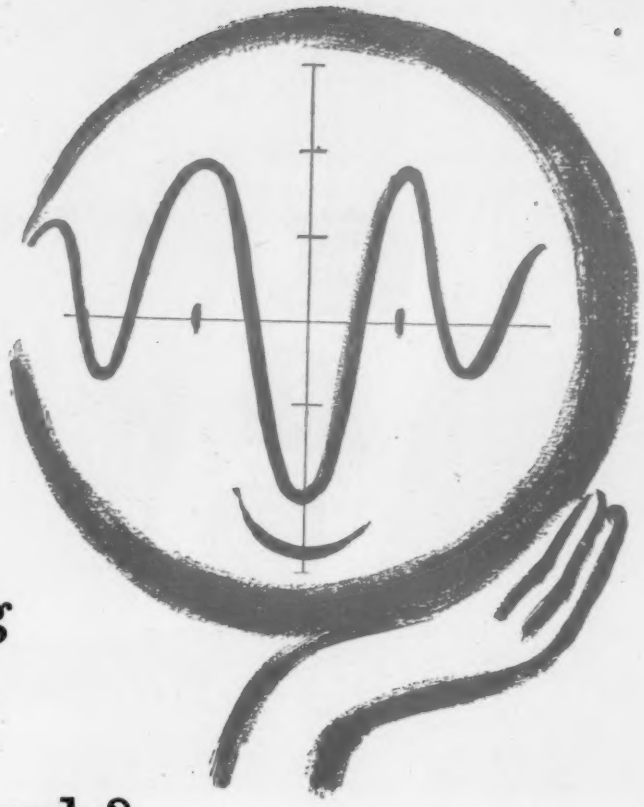

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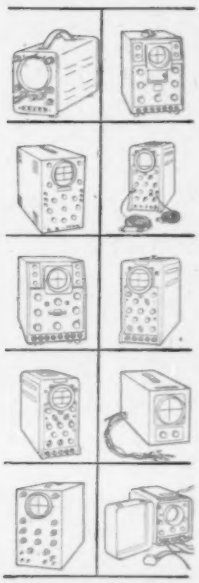

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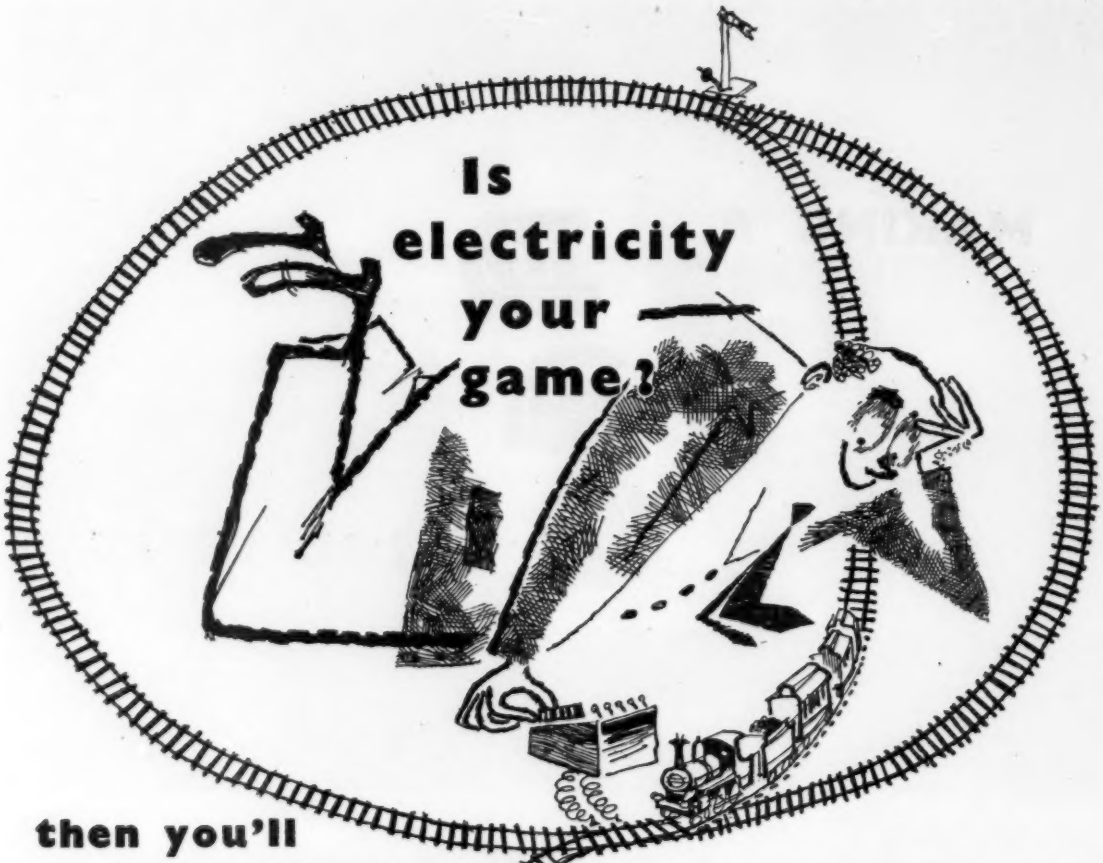

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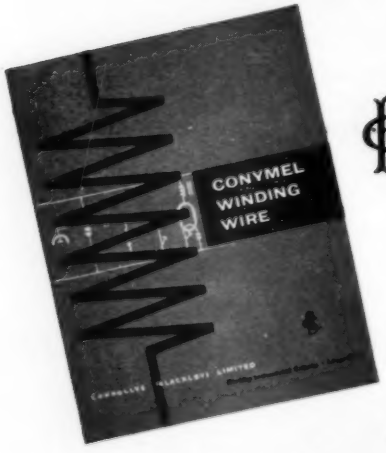

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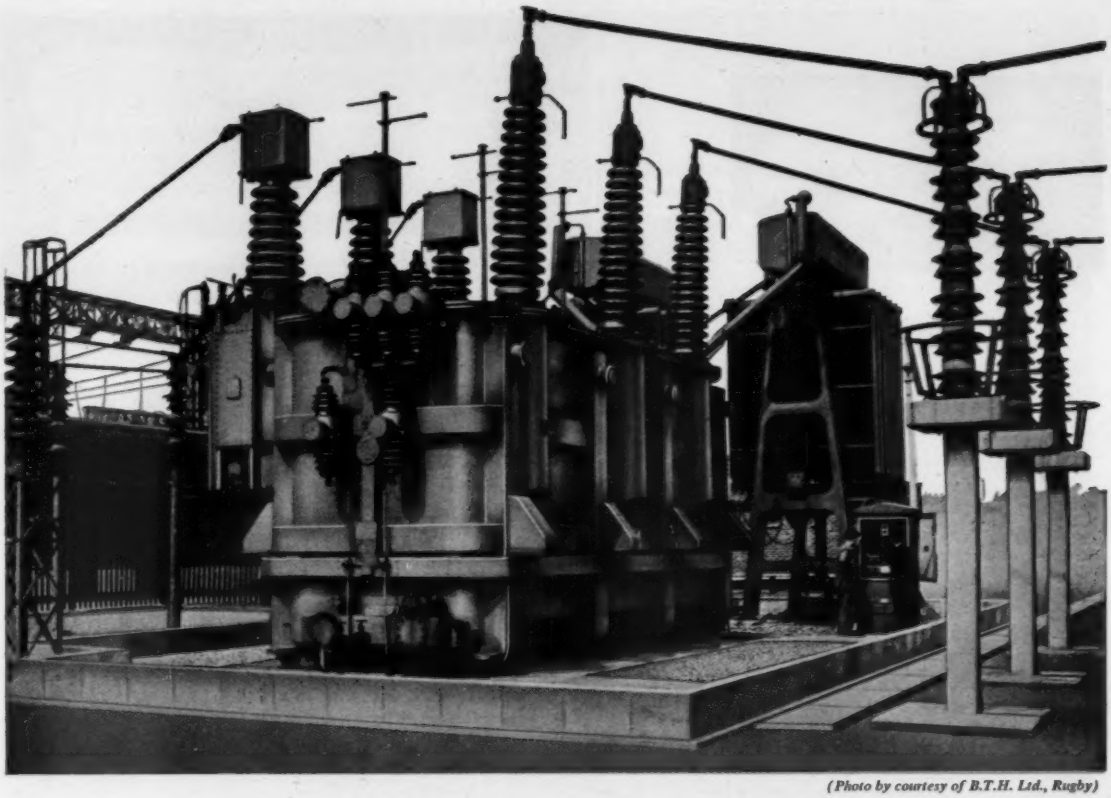

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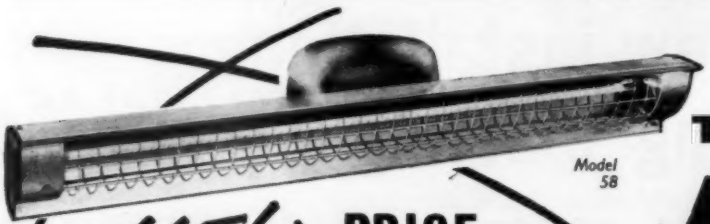

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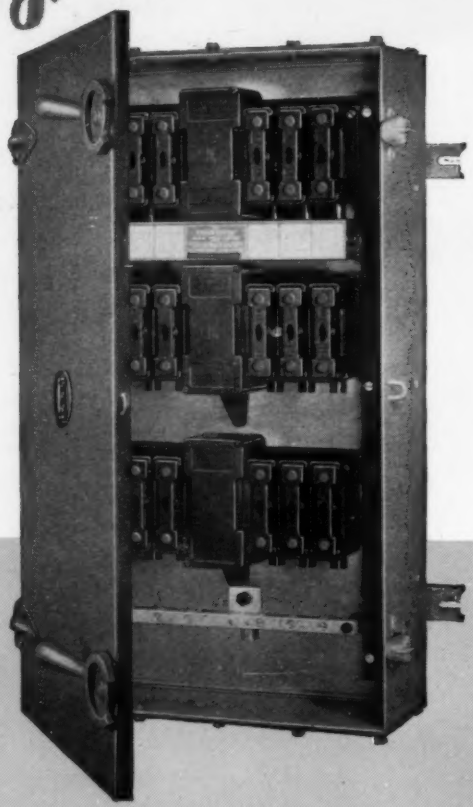

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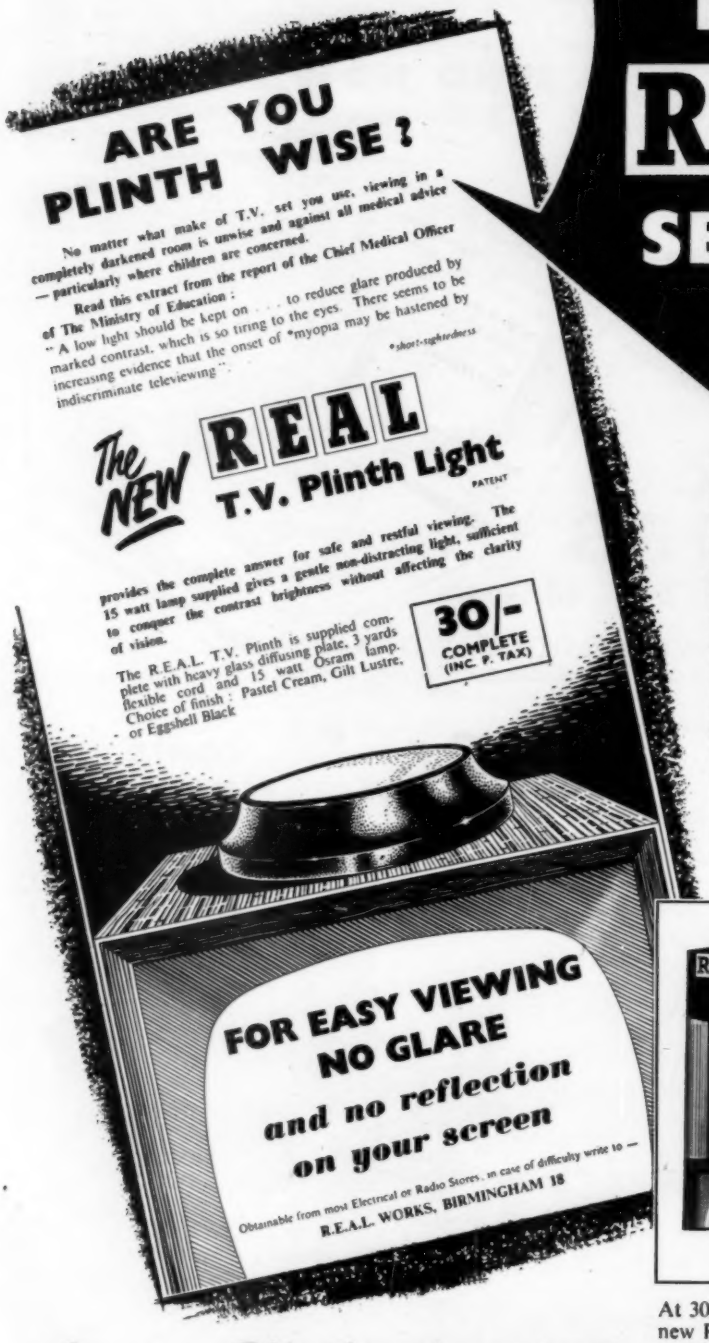
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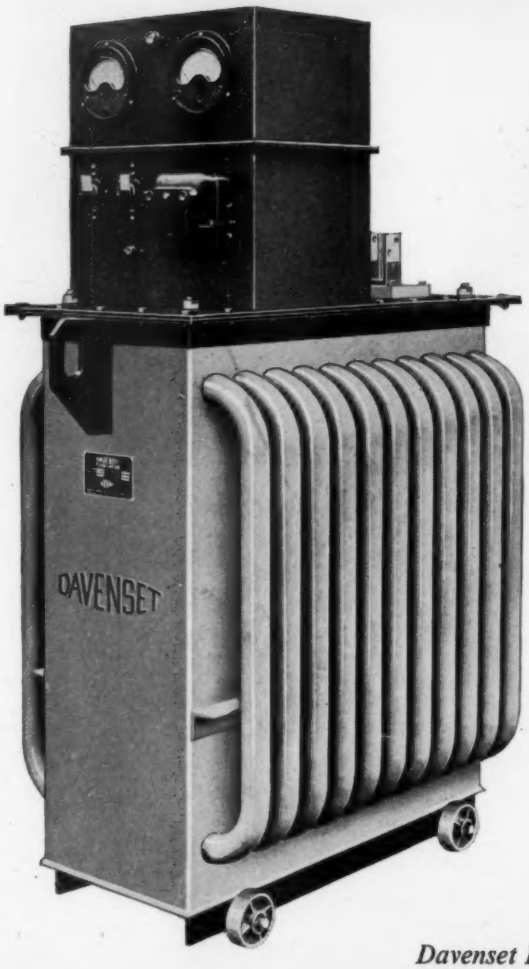

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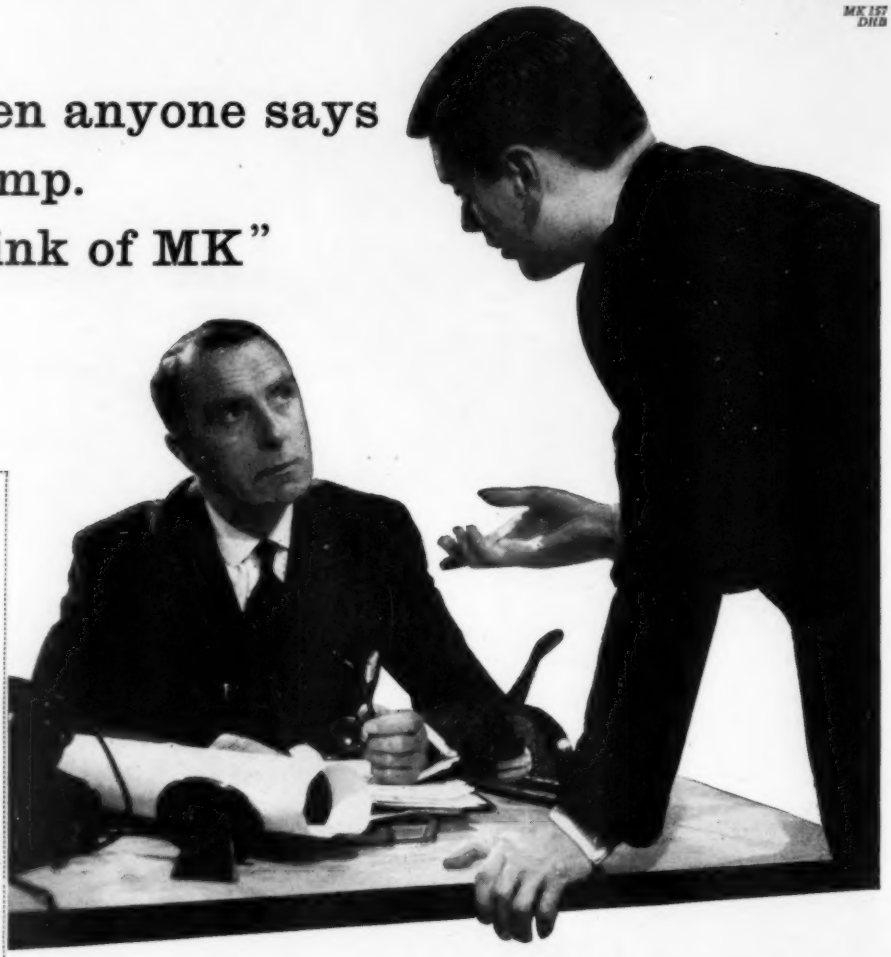

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FRIDAY
29 AUGUST
1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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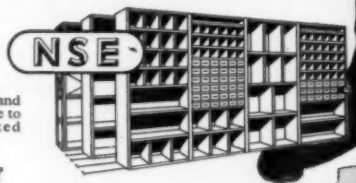

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ELECTRICAL REVIEW

29 August 1958 Vol. 163 No. 9 Established 1872

Engineering Education

IT is becoming increasingly evident that over the years since the war our engineering educational structure has been severely overstrained by the task of producing qualified engineers for the work which this fast progressing scientific age demands. Because of this there is a very real risk that the " end product " may be " half-baked " inadequately trained engineers. Prevailing conditions have undoubtedly intensified this risk.

The demand for technical staff in the field of electronics and in broader-based electrical engineering has been so great that industry has been prepared to accept a lower standard of qualifications, particularly where there has been some specialisation. In present-day circumstances it has perhaps been too easy to land a well-paid job. This has no doubt offered strong temptation to the student to cut short the period of training which formerly would have been regarded as requisite for the vacancy offered. It is also possible that employers have connived at this in their anxiety to obtain staff in order to carry on at all.

Those who are responsible for education and training are now very much alive to the probability that in the years just ahead we may find ourselves with a surfeit of specialists with an extremely narrow outlook, and a dearth of engineers—men able to relate their own work to that of others and to take responsibility for decisions. Probably the saddest part of the story then will be that of those who discover too late that they specialised too early.

In view of these conditions it is not surprising that the planning of education for engineering should be receiving so much attention at the present time and the utmost sympathy and support should be given to all those organisations and educational bodies which are working for the goal of adequate technical personnel for the years immediately ahead.

It is axiomatic that this country's future depends upon the degree of ingenuity and efficiency embodied in our products. In this respect electrical science and engineering are fundamental as they enter into practically every field of endeavour. And, as we are constantly being reminded, our rivals in the technological and industrial spheres are doing everything possible (with greater resources) to raise the standards and numbers of their electrical engineers. We therefore believe it to be imperative that British employers should adopt a more inquisitive attitude into the training and qualifications of those they engage.

It may be necessary for some time to come to acquiesce in lower standards in view of the current shortage in this country, but the merit of the fully qualified man should be recognised in the remuneration and the status accorded to him. It is in this way that industry can take the lead in encouraging students to carry through with the fuller training which should command the higher rewards.

DOUBLING BANKSIDE

There was much public protest both when the Bankside, London, power station was projected and when its erection was commenced. Two objections were that it would spoil the view of St. Paul's Cathedral on the opposite bank of the Thames and that the sulphur fumes from the oil which it was proposed to burn would injure St. Paul's fabric and pollute the immediate neighbourhood. Actually the view was already spoiled by the Post Office's Faraday Building and, as regards the second fear, the station was equipped with an efficient gas-washing plant.

All the same the decision of the Central Electricity Generating Board to go ahead with the second half of the station is a bold one. But there are at least two points in favour of the extension: first, much of the civil engineering work has already been done, so that the kilowatt cost should be lower than that of a new station, and secondly the unsightly original Bankside station, with its multiple steel chimneys, will now disappear.

LOAD FACTOR

The correspondence which followed the publication of Mr. Bellamy's article on load factor in the *Electrical Review* of 25th July dispels some fears which have been expressed of late. These are that in the intensity of development in recent years the ever important subject of load factor may have drifted to the back of the supply engineer's mind. Actually records show that the national load factor has slowly improved over several years, but the advantages of still further improvement are so very great that we feel justified in saying that the present figure of about 50 per cent is still far from good enough.

Much was being done in the earlier days before nationalisation of the supply industry in scientifically developing various types of load so as to bring about the best overall load factor. This was done under the somewhat loose term of "load building," about which so little is heard nowadays. Is the supply industry still giving particular attention to the various classes of load, and are there still specialists, for instance, in mining, steel and chemical engineering on the staffs of the supply authorities?

PART-TIME TEACHING

In a few weeks the 1958-59 educational year begins. Evening classes form a large part of teaching activities in our technical colleges and universities. Full-time lecturers cannot be expected to run all the evening classes, so that those who are employed in industry during the day and can spare one or two evenings a week are welcomed as part-time lecturers. After the war most part-time teaching posts could be easily filled, but now there are many vacancies.

Although a considerable amount of preparation is required, the work is interesting and satisfying and it helps to keep one's own knowledge of the basic theories fresh. The recent annual report of the City and Guilds of London Institute notes that the number of successful candidates for the Technical Teachers' Certificate rose considerably in 1957. This course caters mainly for part-time teachers, but includes those full-time lecturers who have not been able to take a regular course. A further increase in the number of candidates for this examination, particularly from industry, is to be encouraged. Part-time lecturers from industry provide a vital link between theory and practice.

SAVING THE TELEGRAPHS

For some years now the inland telegraph service has been struggling for survival in the face of new developments in the art of communication. Over the past decade it has incurred losses ranging from £3 million to almost £5 million and the possibility of its ever paying its own way again cannot be considered. This appears to be the view of the Advisory Committee appointed by the Postmaster General last September whose report has now been published (H.M. Stationery Office, 1s).

The Committee thinks that there are good reasons for the retention of the service, even though it is losing money, and suggests possible means of reducing the losses. It recommends as one expedient the increasing of charges, although past experience would suggest that the limit has been reached. A sort of "two-part tariff" is proposed with a basic charge plus a "wordage" charge. Other measures are the "elimination or reduction" of the deficits on Press traffic, telegrams to the Irish Republic and railway pass telegrams; and the possible further integration of the system with the telephone or telex services.

EDUCATION IN AMERICA

An article in the August issue of *Electrical Engineering*, the journal of the American Institute of Electrical Engineers, includes a reference to technical education in the United States. The results of universal schooling in America, it says, have been measured in terms of quantity, and quality has been neglected. The article goes on to say:—"The qualifications of European graduates, when they end their formal schooling and receive their first professional degree, would compare with the qualifications of our best students between the master's and the doctorate degrees in our leading schools."

We have long suspected this state of affairs and now our thoughts have been confirmed in print. The insistence of our universities and professional bodies on a high standard of education has been the main reason why we in this country are in the forefront of technical advance. The article referred to above underlines the fact that we must not allow the need for more engineers and scientists to have an adverse effect on our educational standards.

ELECTRIC COOKERS

Particulars of type, size, oven loading and control, hotplates, special features and price of most makes of electric cookers will be given in the next of our surveys of domestic electrical equipment (*Electrical Review*, 5th September). Many models will be illustrated. The following survey (3rd October issue) will deal with food mixers

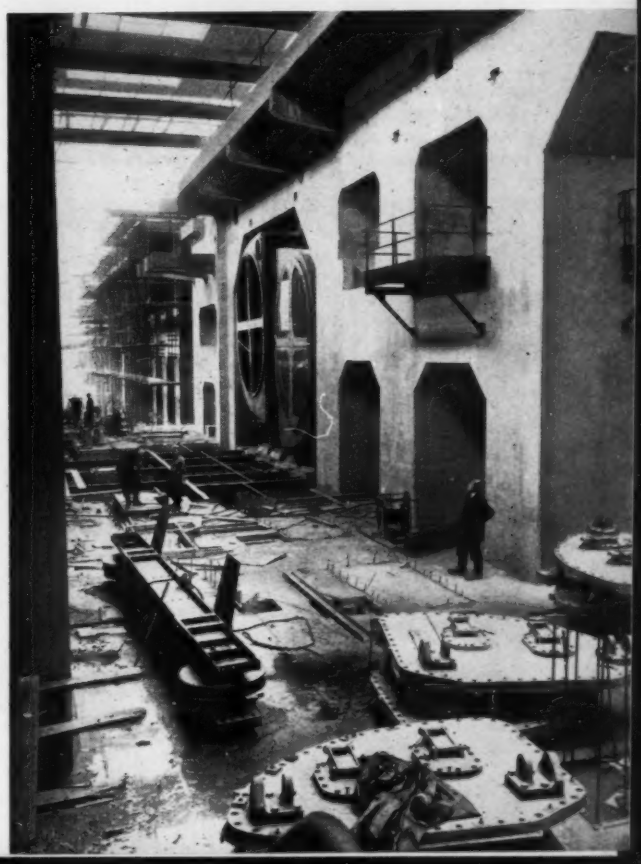
HIGH MARNHAM

Operational details are given of the 1,000 MW station the construction of which we dealt with in our last issue. The second drawing supplement included in this instalment has been specially prepared by our artist to illustrate this description

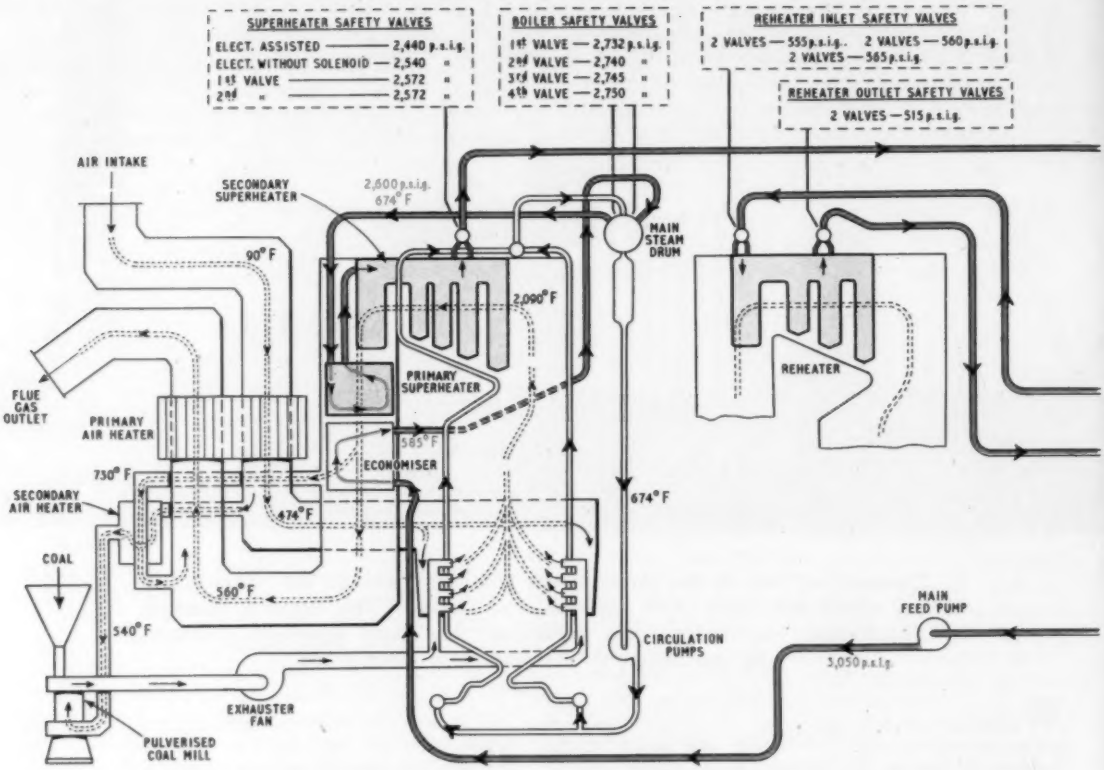
WHEREAS the first part of our description last week related mainly to the construction and layout of the buildings and plant, the following notes mainly concern the station operationally and indicate the major operational flow lines—combustion gases and fuel and the heat cycle—by way of special reference to the accompanying operational flow line drawing. To facilitate all this the rest of the description is written in the present tense as if the station were actually completed and in commission.

Oil for boiler lighting-up purposes is transported to the station by road tanker and stored on the site in two 150 ton capacity oil tanks. The oil is heated and pumped round a circulating main and is tapped off at each boiler. After boost heating it is sprayed into the furnace by burners which are electrically ignited, thus creating the required conditions for commencement of coal firing. When coal firing has been stabilised the oil burners are taken out of service.

Coal is transported by rail from the East Midlands coalfields at the rate of 10,000 tons per day. The daily delivery to the site requires twelve trains, each of 34 wagons, each containing 24½ tons of coal. One reception track and fourteen exchange sidings are provided and four locomotives are required on the site to complete the process of emptying the wagons and returning them to the sidings. The wagons are of the bottom discharge type and will deposit the coal into a ground hopper from which it is transported by conveyors either to the bunkers in the boiler house or to the station stockpile. Weighing and sampling equipment is installed for checking quantity and grade as the fuel is delivered. Coal is deposited and reclaimed by a single reversible conveyor with a delivery capacity of 1,000 tons/hr. Distribution and reclamation of the stockpile are carried out by bulldozer operations. A twin line of conveyors connects the railway ground hopper with the bunkers; each conveyor has a capacity of 500 tons/hr. The coal is screened, crushed, weighed and sampled, and all magnetic material is extracted on the journey to the bunkers.



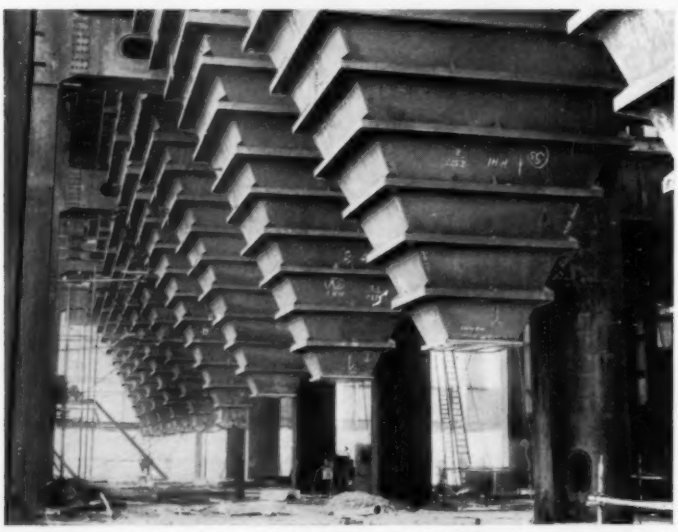
The shells of the condenser sections for the first unit are nearly in their final position



The boiler house bunkers have a total capacity of 11,500 tons. Six bunker outlets are connected to each boiler. The coal leaving each bunker outlet is automatically weighed and delivered by chute to the coal mill, is dried by hot air tapped from the furnace air supply, and after grinding to a predetermined grade of fineness is exhausted from the mill. The air/fuel mixture is then fed into the furnace via the corner burners and ignited.

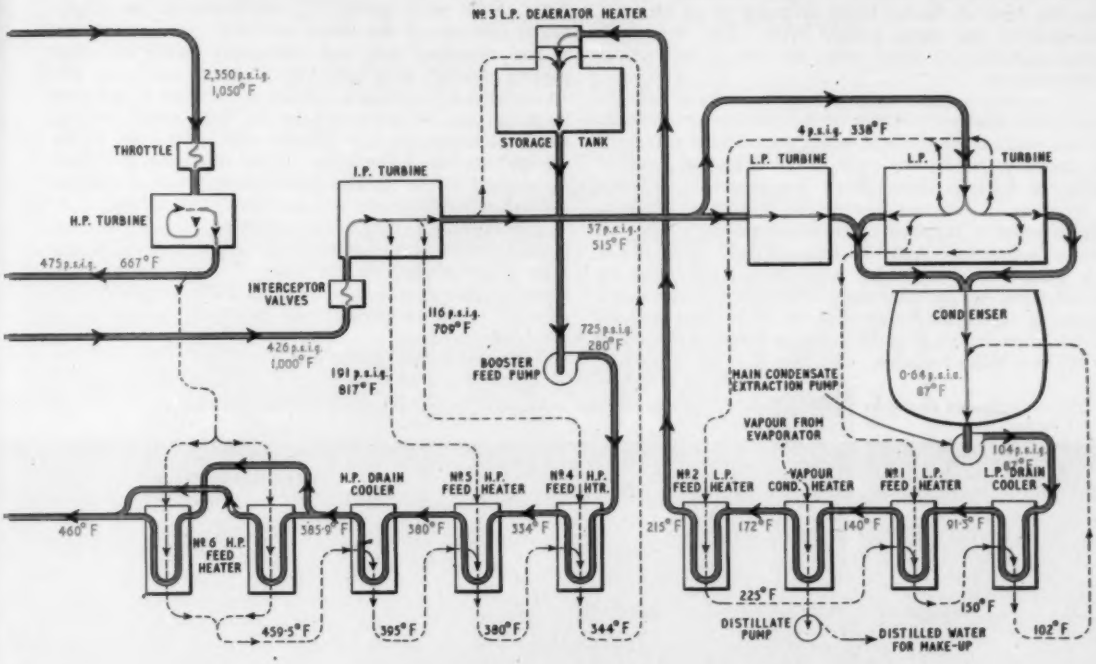
Coarse ash is collected in a hopper below each furnace and is periodically sluiced by a high-pressure jet system into a sump at the east of the main building. The sump is fitted with screens which retain the coarse furnace bottom ash, but allow fine particles to pass out into a dust sump. The coarse ash is removed from the sump by means of a grabbing crane and is taken from the site by road transport. Dust collected from the flue gases by mechanical and electrostatic precipitators is transmitted by means of fluidising conveyors from hoppers on the precipitators to a unit buffer hopper and, in a dry condition, it is pumped to a large storage bunker. There is facility to draw on this bunker for supplies of dust for use in constructional work, but such requirements are comparatively very small.

The dust is then extracted from the storage bunker by rotary feeders and conveyors, and, in a conditioned state, it is deposited into a sluice feeding into the dust sump. The wet dust is collected from the dust sump by slurry pumps which pump the wet mixture through pipelines over the River Trent to a disposal area about 5¼ miles away. The wet dust pipes to the disposal area



Line of hoppers feeding down from the coal bunkers

A power station may be regarded as a high production plant with its appropriate production flow lines, which in fact it is. We have therefore prepared the chart below which indicates the major flow lines at High Marnham, particularly the heat cycle, shown in red, and gives much valuable information relating to the operation of the plant. The pressure and temperature figures on this diagram were supplied by the appropriate manufacturers but it will be appreciated that there may be slight discrepancies between the boiler figures and the turbine figures as a whole due to the extra capacity allowed to meet a fall-off in performance of the complete generating unit.

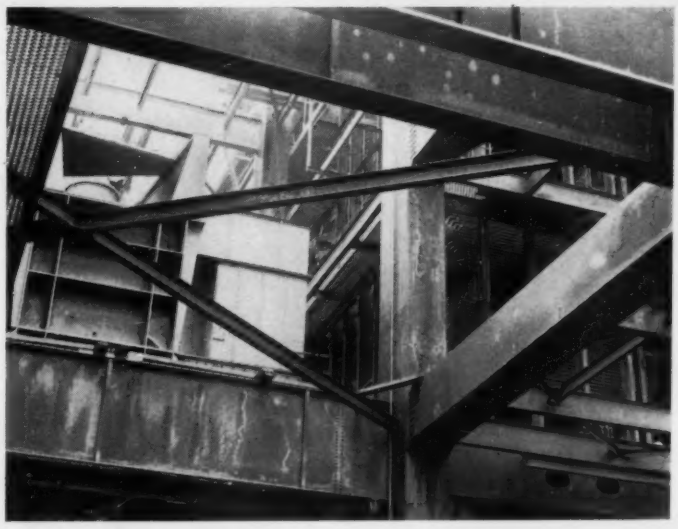


are of 15·3in internal diameter and the quantity of dust disposed of in this way each day when the station is on full load is approximately 1,500 tons.

Combustion Circuit and Heat Cycle

The air and gas flows through each of the two furnaces normally follow parallel paths from the air intakes to the main flue. The air is drawn from the upper region of the boiler house by the forced draught fans and fed through rotary air heaters into the furnaces at the four corners and adjacent to the fuel inlets. The hot gas is drawn from the furnace by the induced draught fans via the economiser, the rotary air heaters, and the mechanical and electrostatic dust precipitators; then, having passed through the induced draught fans, it is led into the main flue and thence to the chimneys. Hot gas is tapped from the main stream to heat a secondary air heater through which hot air is fed into the coal pulverising mills. There is provision for recirculating the hot gas through the furnaces to give a further facility for the control of furnace conditions. Television apparatus is installed to give the operating engineer a view of flame conditions in each furnace.

Condensate is extracted from the single shell condenser by either of two full-duty extraction pumps and thence to the boiler feed water heating system which is designed to raise the temperature of the feed water to 460 deg F by steam heaters and drain coolers. Steam for feed water heating purposes is bled from six points on the turbine. The feed water heating system consists of a low-pressure drain cooler, three l.p. heaters, three high-pressure



Looking up at the rotary air heater and a section of the economiser on the right, from the control level

heaters and a h.p. drain cooler. The l.p. heaters are on the suction side of the booster feed pumps and the h.p. heaters are interposed between the booster feed pumps and the main boiler feed pumps. The l.p. drain cooler and the first two l.p. heaters are of the vertical surface type, the third l.p. heater being arranged as an elevated de-aerator of the direct contact type. The three h.p. heaters and the h.p. drain cooler are also of the vertical surface pattern.

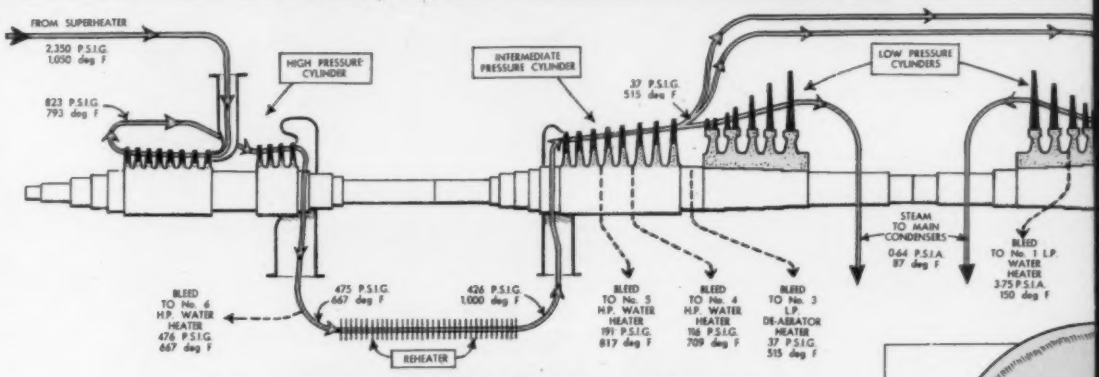
The de-aerator has a water storage capacity to provide at least ten minutes' running of the turbine at full load. Normal slight fluctuations in boiler demand are met from this capacity, but in the event of an abnormal demand additional water is drawn from the reserve feed tanks. In the event of abnormal decrease in feed water demand surplus water is supplied by the extraction pump to the reserve feed tanks. After discharge from the main boiler feed pumps the boiler feed water flow is regulated by two of three 50 per cent duty automatically controlled regulating valves and by two parallel connections fed via the two economisers into the common steam/water drum for the twin boiler furnaces.

Make-up water for each unit is provided by a bled steam single-effect evaporator. The make-up water is then passed through a demineralising plant and introduced into the feed water system at the condenser.

The steam flow is from the common steam/water drum, fitted with centrifugal separators, to the superheater sections of the boiler and twin pipe connections to two combined stop and emergency valves and after passing through governing valves the steam is led into the turbine h.p. cylinder. Apart from some steam bled from the h.p. cylinder exhaust for feed water heating, all steam leaves the h.p. cylinder and is returned to the reheater section of the boiler. After reheating, the steam is returned to the turbine intermediate-pressure cylinder through twin interceptor and emergency stop valves.

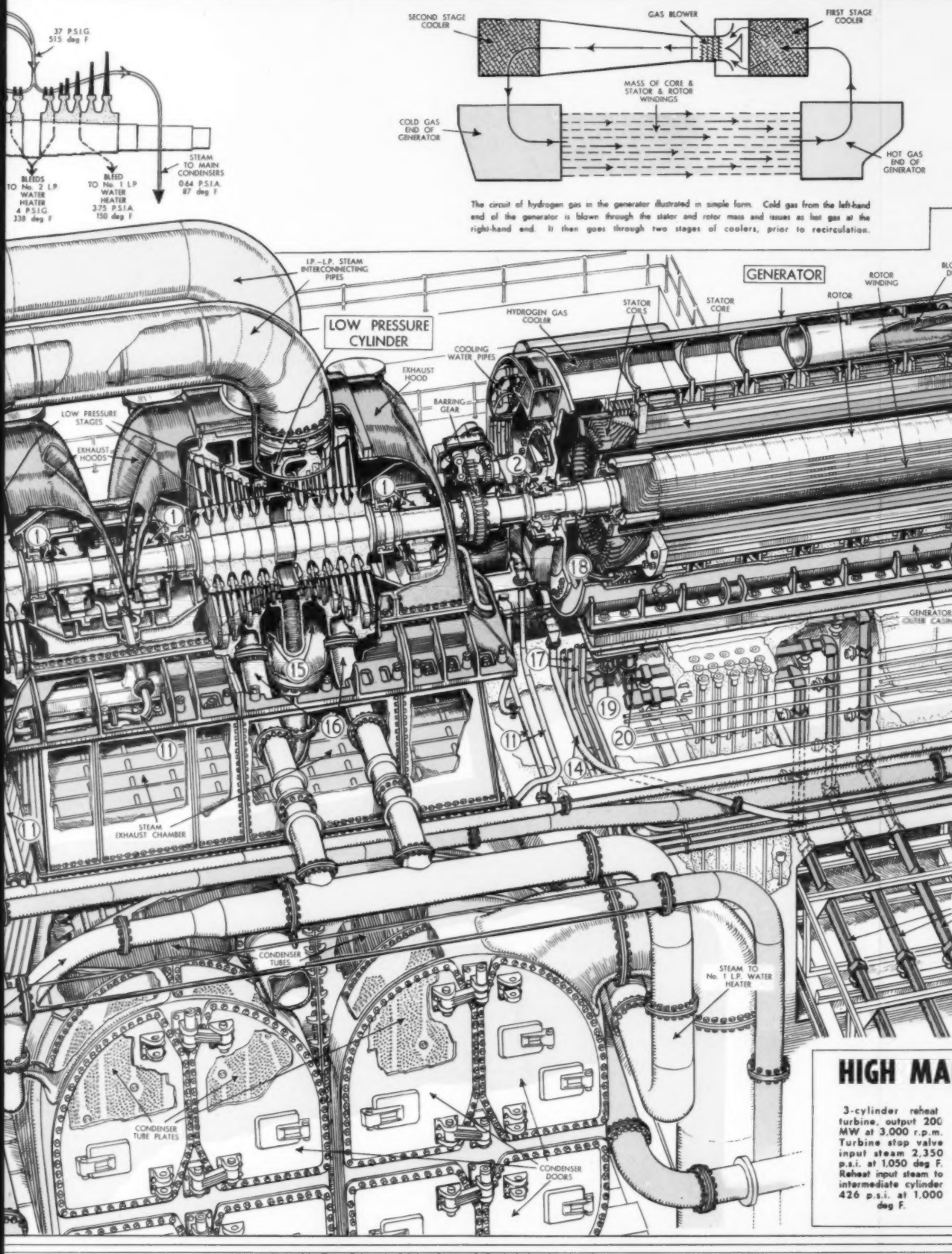
The turbine intermediate-pressure cylinder is combined with one section of the three-flow l.p. cylinders and apart from steam bled for steam heating purposes, all steam is passed from the i.p. cylinder through the l.p. cylinder to the condenser, and the water is returned to the boiler feed water system, thus completing the heat cycle for the boiler-turbine unit.

Upward view of the superheat furnace from basement level looking upwards towards boiler circulating water system



Pressure and temperature flow diagram of the turbine, showing the reheater between the h.p. and i.p. cylinders. The various take-off points at which steam is bled to the water heaters are indicated.

HIGH PRESSURE CYLINDER
FINAL STAGES
INTERMEDIATE PRESSURE STAGES
TOP REHEATED STEAM ADMISSION PIPES
HIGH PRESSURE CYLINDER
INITIAL STAGES
TOP H.P. STEAM ADMISSION PIPES
INTERMEDIATE PRESSURE CYLINDER
TURBINE GOVERNOR
STEAM FROM REHEATER
MAIN OIL PUMP
CROSS CONNECTION BETWEEN H.P. STEAM CHESTS
H.P. STEAM FROM BOILER
BOTTOM H.P. STEAM ADMISSION PIPES
BOTTOM REHEATED STEAM ADMISSION PIPES
STEAM FROM H.P. TURBINE TO REHEATER
REHEATED STEAM INTERCEPTOR VALVE
REHEATED STEAM EMERGENCY STOP VALVE
GLAND STEAM LED TO No. 1 L.P. WATER HEATER
THROTTLE VALVES
COMBINED STOP & EMERGENCY VALVE
H.P. STEAM FROM BOILER


37 P.S.I.G.
515 deg F
BLEEDS TO No. 2 L.P. WATER HEATER 4 P.S.I.G. 338 deg F
BLEED TO No. 1 L.P. WATER HEATER 3.75 P.S.I.A. 150 deg F
STEAM TO MAIN CONDENSERS 0.64 P.S.I.A. 87 deg F
SECOND STAGE COOLER
GAS BLOWER
FIRST STAGE COOLER
MASS OF CORE & STATOR & ROTOR WINDINGS
COLD GAS END OF GENERATOR
HOT GAS END OF GENERATOR
The circuit of hydrogen gas in the generator illustrated in simple form. Cold gas from the left-hand end of the generator is blown through the stator and rotor mass and issues as hot gas at the right-hand end. It then goes through two stages of coolers, prior to recirculation.
I.P.–L.P. STEAM INTERCONNECTING PIPES
LOW PRESSURE CYLINDER
GENERATOR
ROTOR WINDING
ROTOR
STATOR CORE
STATOR COILS
HYDROGEN GAS COOLER
COOLING WATER PIPES
EXHAUST HOOD
BARRING GEAR
LOW PRESSURE STAGES
EXHAUST HOODS
STEAM EXHAUST CHAMBER
CONDENSER TUBES
CONDENSER TUBE PLATES
CONDENSER DOORS
STEAM TO No. 1 L.P. WATER HEATER
GENERATOR OUTER CASING

HIGH MA

3-cylinder reheat turbine, output 200 MW at 3,000 r.p.m. Turbine stop valve input steam 2,350 p.s.i. at 1,050 deg F. Reheat input steam to intermediate cylinder 426 p.s.i. at 1,000 deg F.

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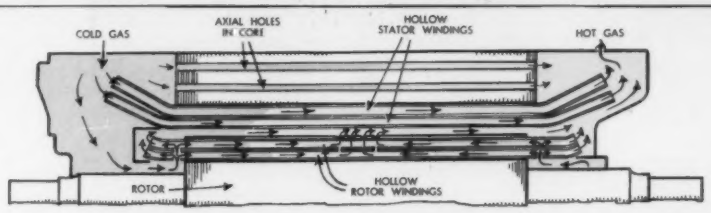
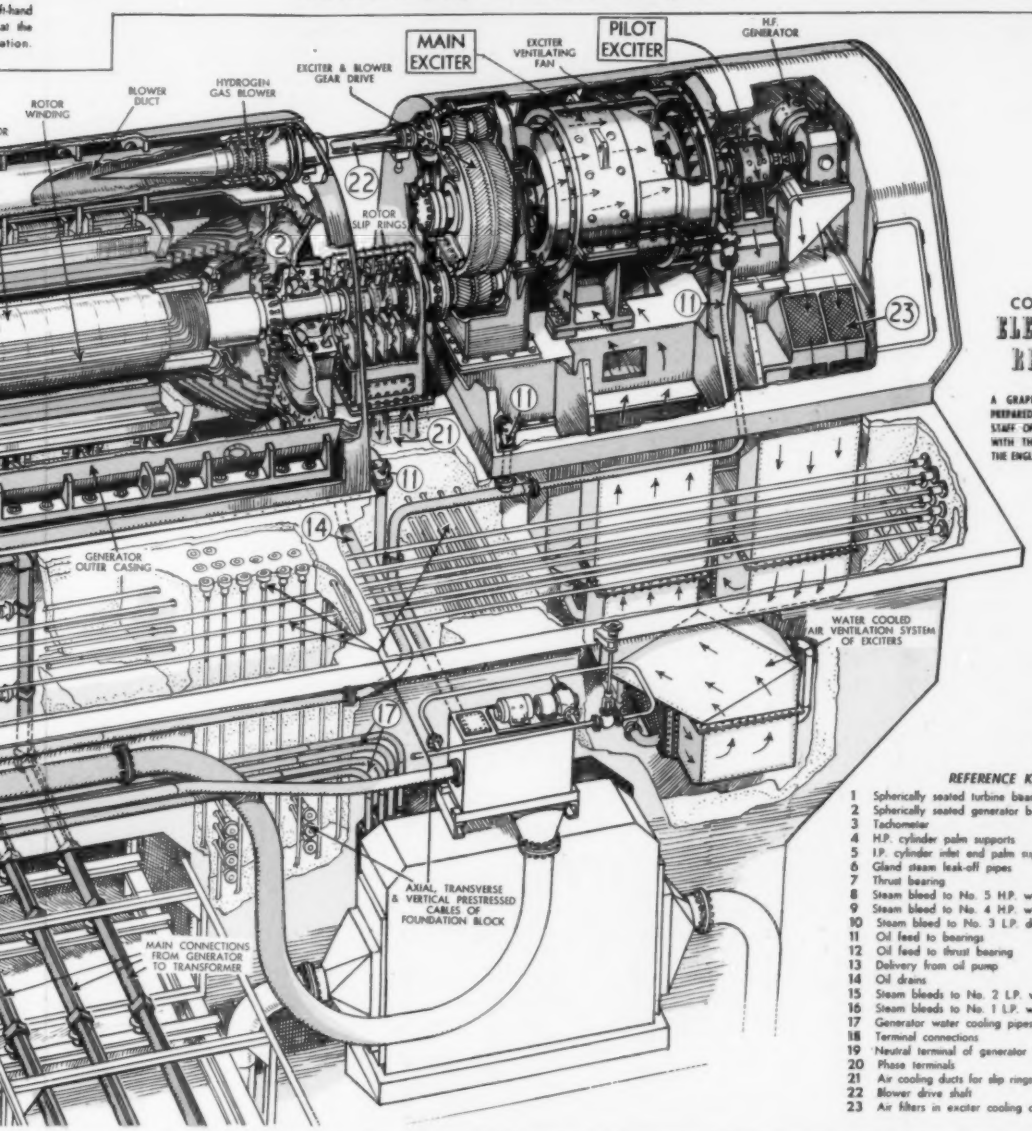
AUGUST 1958



In the cooling system of the generator, hollow stator windings and axial core holes permit the hydrogen gas to conduct heat away to the hot end of the generator, while hollow rotor windings with slotted ports achieve cooling of the rotor.



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ELECTRICAL REVIEW

A GRAPHIC ILLUSTRATION PREPARED BY THE TECHNICAL STAFF OF ELECTRICAL REVIEW WITH THE CO-OPERATION OF THE ENGLISH ELECTRIC CO. LTD.

REFERENCE KEY

1 Spherically seated turbine bearings
2 Spherically seated generator bearings
3 Tachometer
4 H.P. cylinder palm supports
5 I.P. cylinder inlet end palm support
6 Gland steam leak-off pipes
7 Thrust bearing
8 Steam bleed to No. 5 H.P. water heater
9 Steam bleed to No. 4 H.P. water heater
10 Steam bleed to No. 3 L.P. de-aerator heater
11 Oil feed to bearings
12 Oil feed to thrust bearing
13 Delivery from oil pump
14 Oil drains
15 Steam bleeds to No. 2 L.P. water heater
16 Steam bleeds to No. 1 L.P. water heater
17 Generator water cooling pipes
18 Terminal connections
19 Neutral terminal of generator windings
20 Phase terminals
21 Air cooling ducts for slip rings and D.C. brush gear
22 Blower drive shaft
23 Air filters in exciter cooling circuit

HIGH MARNHAM: ONE OF THE 200 MW TURBO-GENERATORS

3-cylinder reheat urbine, output 200 W at 3,000 r.p.m. urbine stop valve nput steam 2,350 s.i. at 1,050 deg F. eheat input steam to termediate cylinder 26 p.s.i. at 1,000 deg F.

IN THIS PICTURE of the turbo-generator, the turbine is sectioned to show the h.p., i.p., and l.p. cylinders on one shaft coupled direct to the generator, and the superheat and reheat pipes and control valves in their relation to the turbine and boiler. Also shown in the upper diagram are the course of superheater and reheat steam through the turbine and reheater and also the take-off points for steam bleeds to the feed-water heaters. The generator is sectioned to indicate the arrangement and proportions of the rotor and stator with their windings, the position and drive of the blower for the hydrogen gas cooling of the unit, the current take-off terminals and busbars to transformer, and the cooling of the exciters and slip rings. The diagrams above the generator indicate in simple form the circulation of the hydrogen coolant through the hollow windings of the generator. Lubricating oil at 10–15 p.s.i. is delivered to the six bearings of the turbine, the thrust bearing and the two bearings of the generator from a pump at the front end of the turbine shaft. The complete turbo-generator set, weighing approximately 1,450 tons, rests on a 35ft high concrete block reinforced by axial, transverse and vertical steel cables pre-stressed by a special process.

MAX MILLAR

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Circulating Water

The cooling water system is arranged on the closed circuit principle with five cooling towers, each of sufficient capacity to meet the requirements of one generating unit. Make-up water is pumped continuously from the River Trent and a continuous purge system has been adopted to stabilise the quality of the water which would otherwise deteriorate because of losses by evaporation.

The towers are connected from the pond discharge point by open concrete ducts to a common suction dock outside the circulating water pump house. Five motor driven circulating water pumps are installed in the pump house, one associated electrically with each unit. The capacity of the pumps is such that two of them will meet the demand from three generating units. The five circulating water pumps are connected on the discharge side to a ring main which distributes the cooling water to the five generating units. For operational or maintenance purposes the distributing ring main can be sectionalised. The return water from the generating units is discharged into another ring main with separate branches to each cooling tower. The heated water is sprayed into the cooling towers and falls into the ponds at the base of the towers, thus completing the cooling water cycle.

Unit auxiliary cooling water services are tapped off the large circulating water main at each unit. A chlorine injection system is installed for the prevention of the fouling of the condenser tubes; the chlorine is injected into the circulating water at the tapping-off point to each generating unit. The main circulating water ducts forming the two ring mains around the turbine house are for most of their length formed of 10ft 6in internal diameter mild steel pipes. River water for common station services such as bearing cooling, ash sluicing and fire protection are extracted from the circulation water suction dock which is adjacent to the circulating water pump house.

Electrical System

The generators supply electricity at 16·5 kV and each feeds into the 275 kV grid system through 210 MVA three-phase generator transformers with switching at 275 kV. Each unit has individual 17·5 MVA unit transformers rated at 16·5 kV/7·2 kV and auxiliary transformers rated at 6·6 kV/433 V. The auxiliary supply system is divided on the unit principle with interconnection between the station service system and the five unit systems at the 6·6 kV level only. Two large 240 V batteries are installed for the more important services and for the emergency lighting in the event of loss of supplies.

The electrical supplies for auxiliary power are at two levels of voltage: the larger motors are supplied at 6,600 V and the smaller ones at 415 V. The station supplies for starting-up purposes and for the common services are obtained from two 22·5 MVA, 275 kV/6·6 kV station transformers which are connected to the supergrid system.

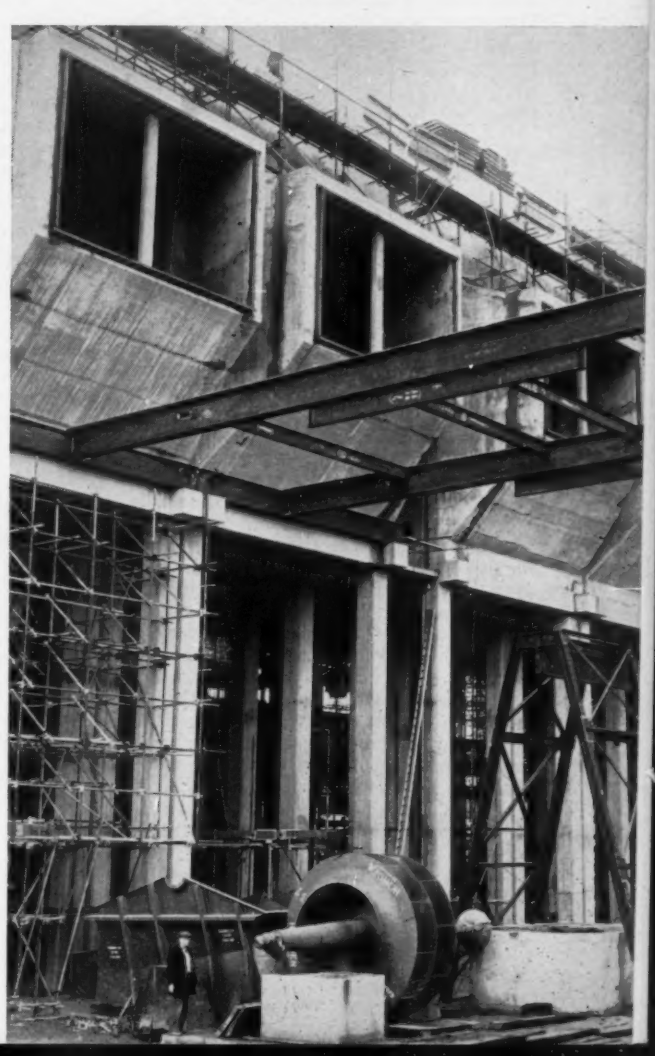
Acknowledgment

We are indebted to the Central Electricity Generating Board; International Combustion, Ltd.; the English Electric Co., Ltd.; Messrs. Freeman, Fox & Partners, civil consultants; and Messrs. Clifford Tee & Gale, architects, for their co-operation in the preparation of this article and the drawings.

The following is a list of the main contractors and principal sub-contractors who are engaged in the civil, mechanical and electrical work at High Marnham: —

H.p. and l.p. pipework and bled steam evaporators, Aiton & Co., Ltd.; coal plant switchgear, Allen West & Co.; ash handling plant, Babcock & Wilcox, Ltd.; instruments and controls, Bailey Meters & Controls, Ltd.; shunting locomotives, Andrew Barclay, Sons & Co., Ltd.; c.w. valves, J. Blakeborough & Son; c.w. make-up screens, F. W. Brackett, Ltd.; main generator connections, British Insulated Callender's Cables, Ltd.; 275 kV switchgear, British Thomson-Houston Co., Ltd.; batteries, Chloride Electrical Storage Co.; main steelwork and river bridge, Dorman, Long & Co; site supplies main and auxiliary cables, Drake & Gorham, Ltd.; turbo-alternators, condensing and feed heating plant, 415 V switchgear and main transformers, English Electric Co., Ltd.; 6·6 kV switchgear, Ferguson Pailin, Ltd.; preliminary civil engineering works, M. J. Gleeson; auxiliary pumps, Gwynnes Pumps, Ltd.; h.p. valves, Hopkinsons, Ltd.; fans and air heaters, James Howden & Co., Ltd.; boilers, International Combustion, Ltd.; site preparation, International Development Co., Ltd.; sootblowers, Ivor Power Co., Ltd.; variable speed and auxiliary driving motors, Laurence, Scott & Electromotors, Ltd.; superstructure and ancillary buildings, Sir Alfred McAlpine & Son, Ltd.; fixed fire fighting equipment, b.f., c.w. and other pumps, Mather & Platt, Ltd.; cooling towers, Mitchell Construction Co., Ltd.; coal handling plant, Mitchell Engineering, Ltd.; water tanks, Newton Chambers, Ltd.; lifts, Otis Elevator Co.; water treatment plant, Permutit, Ltd.; sidings, Railway & General Engineering, Ltd.; c.w. piping, Redheugh Iron & Steel Co., Ltd.; piling, Soil Mechanics, Ltd.; turbine house cranes, Stothert & Pitt, Ltd.; electrostatic precipitators, Sturtevant Engineering Co., Ltd.; superheaters, Superheater Co., Ltd.; foundations, ash pipelines, bridge foundations and chimneys, Taylor Woodrow Construction Co.; chlorination plant, Wallace & Tiernan, Ltd.; de-aerators, James Weir & Co., Ltd.; auxiliary cranes, Wharton Crane & Hoist Co., Ltd., and Herbert Morris, Ltd.; auxiliary transformers, Yorkshire Electric Transformer Co., Ltd.

The casing and rotor of an i.d. fan ready for assembly at the foot of the electrostatic precipitators



LESSONS FROM FRANCE

Different Methods and Common Problems

By JOHN HARLEY, M.I.E.E., A.M.B.I.M.

Last autumn Mr. Harley spent two months in France studying the organisation of the French electricity supply industry. Although the structure of Electricité de France is more centralised than that of the supply industry in this country, the author says that employees have a greater participation in management and more interest is taken in their personal affairs and welfare. French experience with a single distribution department for electricity and gas shows that it leads to divided loyalties and a lack of enthusiasm in selling

UNDER its scheme for the exchange of personnel with other countries, the Central Electricity Authority, as it then was, arranged some years ago that each year some twelve employees of the Central Authority, generating divisions and Area Boards, should be given an opportunity to apply for short periods of study with a foreign supply authority. The supply authorities with which reciprocal arrangements were made were Electricité de France; the Swedish State Power Board; the Detroit Edison Company, U.S.A.; the Società Edison, Milan, Italy; and V.D.E.W., Western Germany. It was stipulated that applicants should be carrying out work in this country which they could study abroad with advantage both to themselves and their employers. It was also required that they should have a good working knowledge of the language, although Italian was not essential if the candidate could speak French, and a knowledge of Swedish was not absolutely necessary. I made application in 1957 because I wished to supplement my studies in management and, because I had friends in France, I stated a preference for studying the organisation of Electricité de France. My first thought was to concentrate on distribution only, but I later decided that this would be like solving a small portion of a jig-saw puzzle. In order to obtain the full picture, I therefore tackled the much greater task of studying the organisation as a whole.

Before going to France in October last year I searched in vain for information published in this country on Electricité de France, our elder sister in nationalisation, which would be of assistance to me on arrival. Perhaps there was an advantage in this failure as there is an assurance that the conclusions reached after two months' study are my own and have not been coloured by information gleaned from other sources, however reliable.

What then were my first impressions? I was at once struck by the realisation that the structure of Electricité de France is very different from that of the supply industry in England and Wales. In particular, it is more centralised, although the country is so much greater in area and the population per square mile so much less. But since valid comparisons can only be made of things which are comparable, I will confine myself to discussing some of the different methods of dealing with common problems of interest to me as a senior district official of an Electricity Board.

Electricité de France is divided into six main departments: Generation and Transmission; Distribution; Construction; Survey and Research; Financial and Legal Services; Personnel and Social Services. All these departments have their headquarters in Paris and they are responsible to the Direction Générale which is organised on a system of joint control and consists of a directeur-générale with two deputies who are assisted by a number of specialised committees. The directeur-générale is under the immediate control of the Administrative Council (Conseil d'Administration) which is in turn closely supervised and directed by Parliament. Serving on the Administrative Council there are five representatives of the State nominated by the Ministers for Industry and Commerce, Finance and Economic Affairs, and Agriculture; five more chosen for their qualifications in financial affairs, industry, and local government (the last ensuring consumer representation) and finally, making a total of fifteen, five representatives of the employees nominated by the five major trade unions.

Employee Participation in Management

Representation of employees at such high administrative level is an important feature of Electricité de France and it is repeated at other levels throughout the organisation. For example, employees are represented on committees dealing with the preparation of general directives on personnel and social services (Commission Supérieure Nationale du Personnel) and their local application (Commissions Secondaires). Employees can also express their point of view on the current management of operating units in joint committees of production and in committees dealing with health, hygiene, safety and social welfare. I have no evidence by which to measure the success of this participation in management, but it is clearly very different from the advisory capacity of employee representatives on committees in our own supply industry.

An interesting example of how participation in management operates in practice is in the unusual methods, to our eyes, of selecting employees to fill vacancies. Vacancy bulletins are prepared by the administration and circulated internally, either locally or throughout the whole country depending on the importance of the post to be filled. (No advertisements are inserted in the Press or technical journals.) A list of candidates is then prepared and copies are circulated to all senior officials concerned, to the five leading trade unions, and to the members of

the appropriate committee in the locality where the vacancy occurs. The candidates are not interviewed, information being obtained inter-departmentally. The management show on the list of candidates those they consider "apt," the others being classed as "inapt." The trade unions also recommend the candidates they prefer, but by declaring them to be either "apt" or "more apt"—a distinction with a difference! By this means it is considered that the general consensus of opinion enables the best candidate to be chosen. In practice, the candidate decided on is usually the one selected by the management.

This example would seem to indicate that employee participation is somewhat ineffectual, but it does serve to show its wide range of application. Moreover, I gained the impression that even here employees felt more at ease in the knowledge that their colleagues were sitting on a committee which would ensure "fair play."

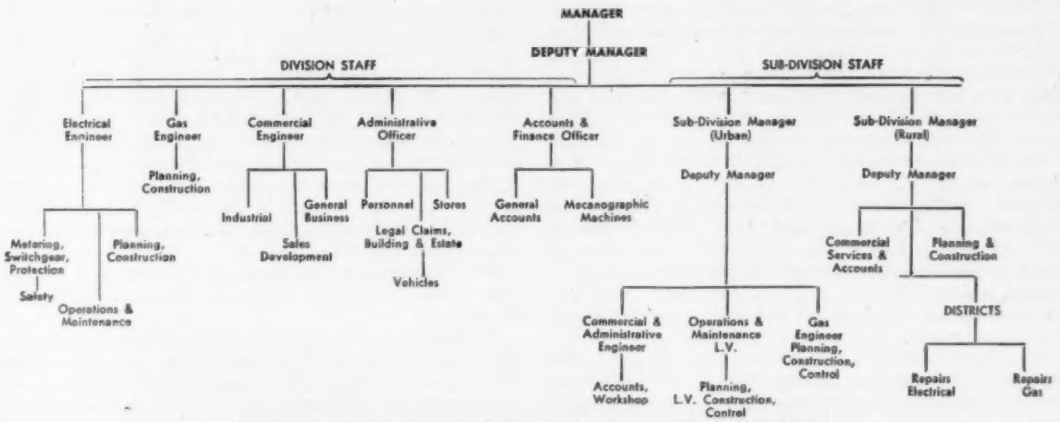
In the wider field of management, employees also seemed to regard representation as a safeguard of their interests, and rather than any reluctance to share responsibility there is a feeling that something is achieved by avoiding, by prior consultation and discussion, what might be unpopular managerial decisions. In addition, it appears to give the staff the belief that Electricité de France is being conducted in the best interests of their country and of themselves and the resulting confidence in the organisation is a psychological gain at least. It is perhaps also one of the factors which make Electricité de France appear to be almost a family. I was, in fact, surprised at the interest taken in the personal welfare and private affairs of the employees. The composition of an employee's family has an effect on such things as holiday money and, in some districts, special tickets at half fare on public transport are available to each member of the family. Financial assistance is also available for house purchase and the Administration Department helps employees to obtain housing accommodation. Such social work is as much an integral part of the organisation as is the interest taken in the health, hygiene and safety of employees at work.

Although in France gas and electricity supply are separate nationalised services, they share a common distribution department, known as "Direction de la Distribution Mixte." Managerial control is centred in Paris and the country is divided into regions (covering areas similar to our Area Boards) and centres. Within the Distribution Department there are sections that deal solely with gas or electricity and services that work for both. The manager of each centre is responsible for both gas and electricity, but has under him a gas engineer and an electrical engineer. Although the two services work in co-operation, separate sets of accounts are kept. In view of the investigation being carried out by a special committee recently set up by the Minister of Power in this country, this aspect of the operation of the French supply industry is of special interest.

It is the opinion of the staff of Electricité de France that economic advantages are being derived from such joint operations as meter reading, collecting money, etc., but no definite evidence was available to confirm or refute this. The British public might welcome joint meter reading but object to having to pay both bills at the same time, particularly as our average consumption is much higher. Careful investigation may show that there would be no appreciable gain in Britain and the disturbance involved would not be worth the bother.

More important, however, it was generally agreed in France that the union of the two services caused divided loyalties which, without doubt, resulted in lack of real drive and enthusiasm in the selling of either fuel. Man cannot serve two masters and when staff are unable to sell with conviction they are handicapped in clinching sales. To sell with enthusiasm spells success. To attempt impartiality can only give rise to doubt in the customer's mind, probably leading to a bad choice, consequent dissatisfaction, and certainly to distrust.

There is no competition or even friendly rivalry in the Distribution Department and the officials tend to adopt the policy of advising the use of electricity or gas depending on which is the more advantageous from the supply point of view rather than which is better for the customer. For example, where an abundant supply of natural gas is available or electricity distribution mains cannot cope with additional load then the sale of electricity for domestic consumption is allowed to flag. In this country we do not have an abundant supply of natural gas, but it must be confessed that we have too many inadequate electricity distribution mains. To encourage the sale of gas and gas appliances at the expense of electricity for such a reason would, in my opinion, be most reprehensible and should not be considered. It would be a short-sighted policy that would render irreparable damage to the electrical industry's future economy. By losing domestic load to gas we would jeopardise the industry's efforts to improve its load factor, so important to-day.



Organisation of the Ile de France Est Distribution Centre of Electricité de France
(In this centre there are three urban and two rural sub-divisions of the type shown above

Healthy competition between gas and electricity in this country gives the consumer complete freedom of choice and should ensure that he obtains the right appliance for his purpose, and not the one which suits the convenience of a particular supply authority.

Under the 1946 Act the nationalised industries in France are not permitted to sell appliances. Although this is rigidly observed so far as electrical appliances are concerned it is ignored by general agreement in the case of gas. There are, however, a number of showrooms scattered throughout the country where staff handle and demonstrate both electrical and gas appliances. Because of the restriction the potentialities of any sales campaign are handicapped at the outset. If a member of the sales staff *does* convince a customer that it would be advantageous to have an electrical appliance then either the customer must purchase the appliance elsewhere or choose an independent electrical contractor to whom the business can be passed. Such an anti-climax to a sales assistant's endeavours must be frustrating to say the least and cannot, in my opinion, lead to enthusiastic sales efforts. Great surprise and interest were shown in France on learning that the Electricity Boards in this country were actively engaged in promoting the sales of all appliances, and everyone asked if there was no opposition to this from private contractors. Our freedom to sell was much envied, and it was agreed that if it applied in France much could be gained in load building.

Complicated Tariffs

In general, there seemed to me to be a lack of drive and energy in France in endeavouring to impress the public with the advantages of electrical appliances for domestic and commercial use. This, coupled with the lack of competition between gas and electricity, probably helps to account for the comparatively slow progress being made in sales of electrical energy to domestic and commercial consumers in spite of the complicated (and far from standard) charges evolved to encourage "off-peak" use. In addition to variations in kilowatt-hour rates for peak and off-peak periods there are additional rates for "full" hours. Although varying in different parts of the country the following times are typical:—

Peak hours: from 7 a.m. to 9 a.m. and 5 p.m. to 7 p.m.	1st November to 1st March
Off-peak hours: from 10 p.m. to 6 a.m. and all day Sunday	
Full hours: all hours not defined above	

A further difference in the price of the kilowatt-hour is made between summer and winter months, and in the domestic tariff the number of primary units applicable is varied during these months. Considerable use is also made of high-frequency signals for the control of time switches and switchgear.

Although the French tariffs are complicated and confusing it should be remembered that Electricité de France must encourage the use of relatively cheap hydro-electric power at the expense of that from thermal stations and that the Government will not permit increases in the present tariff rates. Perhaps we are too timid in Britain and could, with advantage, offer electricity at bare cost for off-peak hours, thus paving the way for better absorption of the energy to be obtained in future from base-load nuclear power stations.

The opportunity provided under the exchange of personnel scheme for studying other methods in other countries is, in my opinion, well worth while. The keen student derives a great deal of pleasure as well as satisfaction from gaining new knowledge, and by studying other methods he equips himself to think on broader lines. Certainly, I was stimulated to think afresh, and I am confident that my study of organisation and management with Electricité de France will enable me to form wiser opinions and make sounder decisions in my sphere as an employee of one of the Area Boards. My grateful thanks are due to all who made the course of study possible and to the staff of Electricité de France who were most helpful and obliging.

INJURY FROM FAULTY WIRING

By a Legal Correspondent

A CASE very directly affecting electrical contractors was recently decided at Newcastle-on-Tyne Assizes and is reported as *Green v. Fireglass, Ltd.* A lady caretaker of premises employed charwomen to clean offices, but, when they were short-handed would lend assistance and in the course of these duties lost the fingers of her right hand. She was attempting to clean an electric fire with a duster, when she received severe electrical burns. The switch was in the "off" position, but the element was alive, the wiring to the main switch being faulty. The three wires which should have been different colours were all coloured red, and through the negligence of the electrical contractor, the switch was connected in the neutral and not the line wire. Consequently, although when the switch was "off" the element did not give out heat it continued to be charged with electricity.

The case involved a number of considerations. The injured lady was not the servant of the defendant company, the owners of the premises, but an independent contractor, so that in legal parlance, the relationship was that of invitor and invitee. The Court held that in these circumstances the owners of the premises were under no legal obligation because they had employed a firm of reputable expert electrical contractors to inspect the premises when they took over. In this way they relieved themselves of any legal obligations although the case might have been different if the relationship had been that of master and servant, if there had been a special statutory requirement binding the owner of the premises, if the task was extra hazardous, or where the owners themselves might have had the specialised knowledge required. There was a suggestion that periodical inspections should have been made by the electrical contractors, but the answer given to this was that no ordinary prudent man would have his wiring re-inspected within five years.

The Court, in dismissing the claim against the company, the owners of the premises, pointed out that there would have been no defence if the claim had been brought against the contractors. It can be expected, in view of this case, that more claims may be directed at electrical contractors rather than the owners of premises.

I.E.E. Section Chairmen

BIOGRAPHIES OF OFFICERS FOR THE 1958-59 SESSION

IN a few weeks the London meetings of the Institution of Electrical Engineers for the 1958-59 Session will be in full swing. Mr. S. E. Goodall, the new President, will deliver his address on Thursday, 9th October, and this will be followed shortly afterwards by the addresses of the chairmen of the specialised Sections. An outline of the career of Mr. Goodall was given in our issue of 18th July, and we now give biographical details, together with their portraits, of the Section chairmen.

Mr. R. A. Marryat, B.Sc.(Eng.), M.I.E.E. (Utilisation Section), is managing director of Marryat & Place, Ltd., and a director of Dewhurst & Partner, Ltd., and of Marryat & Scott Holdings, Ltd. He was educated at Oundle School, and received his practical training in the three companies founded by his father, the late Howard Marryat. In 1931 he joined the staff of Marryat & Place, Ltd., becoming general manager in 1941 and managing director in 1944. Mr. Marryat has taken an active part in the affairs of the Electrical Contractors' Association, and he was president in 1955-56. He is chairman of the Association's Technical Committee, of which he has been a member for fifteen years, and he also represents the Association on the I.E.E. Wiring Regulations Committee, the E.R.A., various B.S.I. Committees, and on the City and Guilds Advisory Committee on Electrical Installation Work. He has been a member of the E.C.A. Council since 1949. Mr. Marryat is also a member of the Codes of Practice Committee for Electrical Engineering and is at present chairman of a committee dealing with the redrafting of the Code of Practice on Electrical Installations—General.

Mr. R. A. Marryat

Mr. G. Millington, M.A., B.Sc., M.I.E.E. (Radio and Telecommunications Section), was educated at St. Olave's Grammar School and Clare College, Cambridge, and subsequently spent two years in the Cavendish Laboratory where he was engaged in research work on beta-rays. He joined Marconi's Wireless Telegraph Co., Ltd., in 1931 as assistant to Mr. T. L. Eckersley, chief of the Propagation Section, and when Mr. Eckersley retired in 1946, Mr. Millington succeeded him as chief of that section. For many years Mr. Millington has specialised in theoretical and experimental studies relating to radio wave propagation, and many of the present-day propagation curves owe much to the influence of his work. Since the war he has attended many international conferences, including the International Telecommunications Union conference in Atlantic City, N.J., the Plenary Assemblies of the International Radio Consultative Committee, of which he is now a group vice-chairman, and a number of the General Assemblies of the Union Radio Scientifique Internationale.

Mr. G. Millington

Mr. D. P. Sayers, B.Sc., M.I.Mech.E., M.I.E.E., M.Amer.I.E.E. (Supply Section), is chief commercial and operations engineer with the Central Electricity Generating Board. He graduated at Birmingham University in 1923 and after a brief period with British Insulated Cables, Ltd., he became, in 1924, mains construction engineer to the Blackburn Corporation, and later was with G. V. Twiss & Partners. From 1930 to 1936 he was with Kennedy & Donkin, with whom he was engaged on C.E.B. work and in constructional work in connection with the Northern Ireland electricity scheme. Mr. Sayers joined the distribution department of the Sheffield electricity undertaking in 1936, and later was chief assistant engineer at Sheffield. He was appointed deputy chief engineer and manager of the Birmingham Corporation electricity undertaking in 1943, and when the industry was nationalised in 1948 he was appointed chief engineer of the Midlands Electricity Board. A year later he went to the headquarters of the B.E.A. where he held successive posts until his return to the Midlands Electricity Board as deputy chairman. He became chief contracts officer of the C.E.A. in February last year and was appointed to his present position in January last.

Mr. D. P. Sayers

Mr. J. K. Webb, M.Sc.(Eng.), B.Sc.Tech., M.I.E.E. (Measurement and Control Section), who is now a division head of Standard Telecommunication Laboratories, Ltd., at Enfield, received his early education at Glasgow High School and Woodbridge Grammar School. He joined the Lancashire Dynamo & Motor Co., Ltd., Trafford Park, in 1919 as a technical apprentice and two years later, on being awarded an "Armaments" scholarship, entered the Manchester College of Technology where, under Professor Miles Walker, he graduated in 1924. In the same year he joined the Western Electric Co., Ltd., North Woolwich (which afterwards became Standard Telephones & Cables, Ltd.). About this time he attended East London College (now Queen Mary College) part-time and, under Professor J. T. MacGregor-Morris, was awarded his M.Sc.(Eng.) degree in 1927. He served with the International Telephone & Telegraph Laboratories, Inc., at Hendon from 1928 until 1934 when he returned to S.T.C. at North Woolwich until he joined its associate S.T.L. at its inception in 1945 as head of the measurement section. From about 1930 until the outbreak of war in 1939 he was a part-time lecturer at Regent Street Polytechnic under Mr. P. Kemp. The early days of his career were devoted to the development of high-voltage power cables and accessories, but later he was mainly concerned with the development of materials and components associated with telecommunications. For some years he was chairman of the Electrical Research Panel of the British Scientific Instrument Research Association and for the past year has been chairman of the reconstituted Electrical and Electronics Panel.

Mr. J. K. Webb

High-Voltage D.C. Cables

Electric Stress and Loading

By A. W. STANNETT, B.Sc., A.M.I.E.E., and D. H. SHROFF, B.Sc., Graduate I.E.E.*

THE rating of a conventional single-core high-voltage cable for operation in an a.c. system depends solely on the temperature at which the insulation can operate without deterioration. The electric stress distribution in such a cable is not materially affected by change of load because it is controlled for a given geometry solely by the dielectric constant of the insulating material which over the normal temperature range is sensibly constant.

In the case of a cable in a d.c. system, however, these conditions no longer apply because the electric stress depends upon the resistivity of the insulating medium[1] and this property is highly temperature-dependent. The electric stress thus depends upon the loading conditions and this factor must be taken into account in the design of the cable and the assessment of its rating.

The resistivity of insulating materials varies with time of electrification, temperature and, to some extent, electric stress. Fig. 1 shows some typical electrification curves from which it will be seen that the time taken to reach a reasonably constant value increases with the resistivity and may be several hours for the higher resistivity materials.

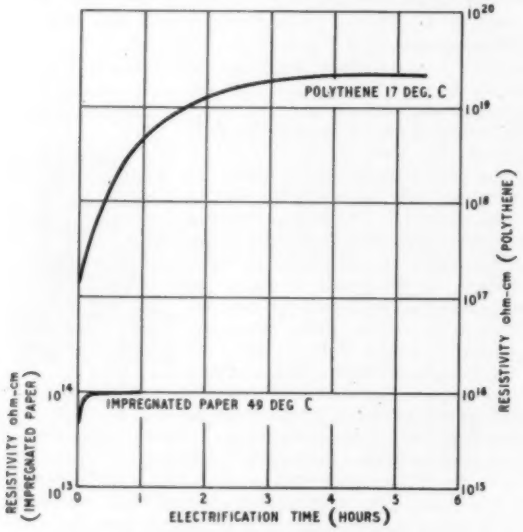


Fig. 1.—Typical electrification curves

Fig. 2 shows the variation of the equilibrium value with temperature for the undermentioned materials:—

(a) Ordinary oil/rosin mass-impregnated paper in the form of 33 kV single-core cable.

(b) Paper pre-impregnated with oil/microcrystalline wax non-draining compound in the form of 11 kV single-core cable.

(c) Polythene (Grade 2) covered wire, the wall thickness being 0·015in and the conductor diameter 0·032in.

The variation of resistivity with temperature is usually considered on theoretical grounds to be given by ρ_T in the expression $\rho_T = ae^{b/T}$ where a and b are constants and T the absolute temperature.[2] Whilst this expression represents the experimental data accurately, it does not lend itself to easy mathematical handling. However, an empirical expression $\rho = Ae^{Bt}$ where A and B are constants and t the temperature in deg C does not suffer the same drawback and fits the experimental points sufficiently well over the temperature range considered (Fig. 2).

The variation of final resistivity with stress has not been examined comprehensively, such measurements as have been made on the materials mentioned above suggesting that the decrease of resistivity with stress is small in the case of impregnated paper, probably of the order of 5 per cent or less over the range 0 to 50 kV/cm, but greater for polythene.

Making the simplifying assumption that the resistivity does not change with the magnitude of the electric stress, the stress (kV/cm) at any radius x cm in the wall of a

* Both of the Central Electricity Research Laboratories, Leatherhead.

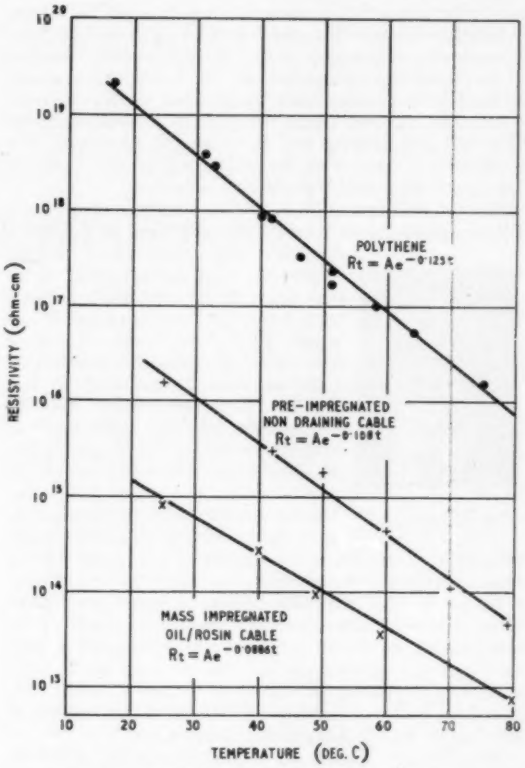


Fig. 2.—Variation of final resistivity with temperature

steadily-loaded single-core cable, as shown in the appendix, is given by

$$\frac{EBP}{r_1^{-BP} - r_2^{-BP}} \cdot \frac{I}{x^{(BP+1)}} \quad .. \quad .. \quad (1)$$

where E=applied voltage kV

B=constant in the expression $\rho_t = Ae^{Bt}$

$P = \frac{gH}{2\pi}$ where g is the thermal resistivity of the insulant (deg C/W/cm) and H the heat dissipated in the conductor (W/cm length)

r_1=radius of conductor (cm)

r_2=radius of insulation (cm)

Under conditions of no load there is no temperature gradient through the insulating wall and the stress distribution follows the same law as in the a.c. case.

If account must be taken of the variation of resistivity with stress, a step-by-step method akin to the method devised by Brazier[3] for determining the thermal stability of cables can often be used. The insulating wall is considered as a convenient number of thin concentric cylindrical shells, the radii being in geometric progression. The temperature of each shell can be calculated, the resistivity, obtained from the resistivity/temperature graph, being used to determine the insulation resistance of each cylinder. From this the voltage drop across each shell and therefore the stress can be derived. If initially the effect of stress on resistivity is ignored, the approximate stress obtained can be used to correct the resistivity value used. One or two successive corrections should be sufficient to obtain the desired stress distribution with adequate accuracy. Since the resistivity tends to decrease with increase of stress, particularly in the case of polythene, equation (1) gives a pessimistic result.

It is of interest to note that the stress distribution does not depend upon the actual resistivity value but on the manner in which it changes with temperature. Likewise it does not depend on the actual temperature at which the cable operates but on the temperature gradient across the insulating wall.

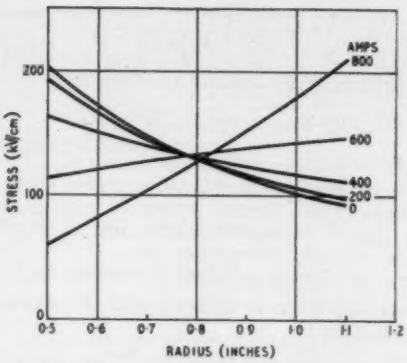


Fig. 3.—Distribution of electric stress on the wall of an oil/rosin impregnated paper cable for various loads

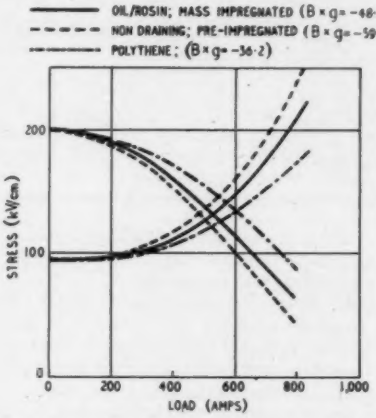


Fig. 4.—Variation of stress at inner and outer insulation radii with load for various materials

Typical Cases

The effect of load on the stress distribution in a hypothetical mass-impregnated oil/rosin cable of 0·6 sq in conductor (diameter 1·023in) to operate at 200 kV d.c. with a stress at the conductor of 200 kV/cm at no load is illustrated in Fig. 3. It will be seen that at the higher loads the maximum stress appears at the outer diameter of the insulation, being virtually constant across the insulating wall at a light loading of about 520 A. The stresses at the inner and outer insulation radii for given loadings are summarised in Fig. 4.

The slope of the log resistivity/temperature curve is a property of the insulating material used and so the variation of stress with load will not depend purely on the geometry of the cable. Fig. 4 also shows the stresses at conductor and sheath for the two other insulants referred to: pre-impregnated non-draining cable and polythene. In both cases it has been assumed that the cable dimensions and general construction are the same. In the case of polythene, however, the thermal resistivity has been taken as 294 deg C/W/cm compared with 550 deg C/W/cm taken for both impregnated paper cables.

From the point of view of electric stress distribution a d.c. cable would operate ideally where $-BP=1$ (Equation 1), as then the stress is uniform through the insulating wall. Since B and g are constants for a material it follows that there is an optimum rate of heat transfer through the cable which will be peculiar to the particular insulant used. From the design point of view it is unfortunate that this optimum condition leads to somewhat lighter loadings for a given conductor size than are normally used for cables operating on a.c. to normal conductor temperatures.

Paper impregnated with oil or compound has been found over the years to be the most suitable insulating material for high-voltage power cables for a.c. operation. However, it is possible that other materials such as polythene may be suitable for d.c. application where discharges in voids are not likely to be a serious problem. In choosing an insulating material for a d.c. cable it is worth bearing in mind that the lower the product Bg the higher the optimum loading from the stress point of view.

Fig. 4 illustrates the superiority of polythene over impregnated paper in this respect, for even though B is numerically greater for polythene ($-0{\cdot}123$ compared with $-0{\cdot}0886$ to $-0{\cdot}108$), the value of g is nearly one-half that of impregnated paper (294 compared with 550 deg C/W/cm). Consequently, the optimum loading is higher for a polythene than for an impregnated paper cable and if these loadings are exceeded the polythene cable will operate at the lower stress, other things being equal.

Conclusion

The distribution of electric stress in a d.c. power cable will depend upon the load that is being carried. At loads comparable with those normally used in a.c. cables the maximum stress will appear at the outer radius of the

APPENDIX

Temperature at any distance x is given by

$$\theta_x = \theta_A + HG_E + \frac{gH}{2\pi}\log\frac{r_2}{x}$$

where θ_A = Ambient temperature deg C
H = Heat generated in the conductor W/cm length
G_E = Total thermal resistance external to the insulation thermal ohms/cm length
r_2 = Radius of insulation cm
g = Thermal resistivity of insulation deg C/W/cm

Voltage drop across an elemental shell of thickness δx at radius x is given by

$$\delta v = i\frac{\rho x}{2\pi x}\delta x = \frac{E}{R_T}\frac{\rho x}{2\pi x}\delta x$$

where i = Leakage current $= \frac{E}{R_T}$ amps per cm length

R_T = Total insulation resistance per cm length
ρx = Resistivity at distance x

$$\text{Now } R_T = \int_{r_1}^{r_2}\frac{\rho x}{2\pi x}\delta x$$

but $\rho_1 = Ae^{Bt}$

$$\text{hence } R_T = \int_{r_1}^{r_2} A\frac{e}{2\pi x}B(\theta_A + HG_E + \frac{gH}{2\pi}\log\frac{r_2}{x}).\ \delta x$$

$$= \frac{A}{2\pi}\frac{e^{DB}r_2^{BP}}{BP}\left[r_1^{-BP} - r_2^{-BP}\right] \text{ provided } BP \neq 0$$

where $D = \theta_A + HG_E$

and $P = \frac{gH}{2\pi}$

$$\therefore \text{ stress} = \frac{\delta v}{\delta x} = \frac{E\,.\,BP\,.\,2\pi\,Ae^{B(D + P\log\frac{r_2}{x})}}{Ae^{DB}r_2^{BP}(r_1^{-BP} - r_2^{-BP})2\pi x}$$

$$= \frac{EBP}{r_1^{-BP} - r_2^{-BP}}\cdot X\frac{1}{(BP+1)}$$

If $BP = 0$;

$$\text{then } R_T = \frac{A}{2\pi}e^{DB}\int_{r_1}^{r_2} x^{-1}\,\delta x = \frac{A}{2\pi}e^{BD}\log\frac{r_2}{r_1}$$

$$\text{and stress} = \frac{E\,2\pi}{Ae^{BD}\log\frac{r_2}{r_1}}\cdot\frac{Ae^{BD}}{2\pi x} = \frac{E}{x\log\frac{r_2}{r_1}}$$

Now BP is zero when H is zero, that is when there is no load on the cable.

insulation. There is an optimum loading condition which depends on the insulating material used, at which the stress through the insulating wall is constant.

If materials other than impregnated paper, such as polythene, could be used for d.c. cables then improved stress distribution at higher loads would be obtained. In this connection there may be scope for the development of insulating materials with low thermal resistivities.

The work described above was carried out at the Central Electricity Research Laboratories, Leatherhead, and the authors are indebted to the Director, Dr. J. S. Forrest, for permission to publish this paper.

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SUPPLY IN MALAYA

THE eighth annual report of the Central Electricity Board of the Federation of Malaya, a copy of which we have received from Mr. J. Sharples, B.Sc.(Eng.), M.I.E.E., the general manager, records a further substantial increase in sales of electricity to all classes of consumers. In the past five years consumption has risen from 208·2 million kWh (1952-53) to 396·5 million (1956-57), the annual rates of increase being 13·6, 15·8, 19·2, 18·3 and 16·5 per cent. Consumers numbered 139,124, compared with 66,368 in 1953.

At the end of the year under review the extensive illuminations during the Independence celebrations resulted in an unprecedented increase in the system maximum demand and the Connaught Bridge power station, completed to its full capacity of 80 MW in 1956, was called upon to carry a load of over 70 MW. This station generated a total of 344·5 million kWh during the year ended 31st August, 1957, and the overall thermal efficiency averaged 25·39 per cent. The only other steam station, Bungsar, was operated on a standby basis. In addition the Board has two small hydro-electric stations and 34 diesel stations. Before the end of the current year the first two 10 MW turbo-alternators are expected to be commissioned at the new Malacca power station, for which an ultimate capacity of 40 MW is planned. This station will afford relief in the areas supplied from the central network, which is being extended southwards into Johore and northwards to the boundaries of Selangor. A start has also been made on a small hydro-electric scheme at Robinson Falls (900 kW) and other similar projects are being examined, though the shortage of engineers has hampered this work. The most important future development is the Cameron Highlands hydro-electric project, estimated to cost some $120 million. This has secured the support of the Malayan Government and a sum of $25 million has been included in the current five-year programme (Malayan $=2s 4d). Before the first stage can be brought into operation, however, it is thought that there may be a critical shortage of plant in 1961 and 1962 and measures to meet this are under consideration.

The revenue balance for the year, after meeting interest charges and providing for reserves, was $1,666,123 (against $1,543,096). A dividend of 4 per cent was again paid on the Government-held ordinary stock, leaving $209,498 ($133,363) in the net revenue account. The results are regarded with satisfaction in that considerable increases in costs were met without resort to higher tariffs. The overall operational cost per kWh sold was reduced from 7·67 to 7·42 cents and income fell from 9·72 to 9·40 cents per kWh, the lowest figure since the Board was established in 1949.

In the Federation as a whole, 1,120 million kWh was generated last year (692 million in steam, 179 million in diesel and 249 million in hydro-electric stations). Consumption aggregated 964 million kWh, of which supplies to the tin and other mining industries accounted for 589 million kWh.

VIEWS on the NEWS

By REFLECTOR

LAST week, in the "Personal" column of *The Times*, the secretary of the Pit Ponies Protection Society suggested ways in which these animals' lives might be made more endurable; he thought, among other things, that electric battery lamps should be fixed to their collars or their roadways electrically lighted. He went on to ask why the employment of horses in mines should not cease entirely within seven years and said:—"Why not plan atomic power stations to generate nuclear electricity equivalent to 30 million tons of coal in seven years?" I am sure that he has the sympathy of electrical men, but the drift of his reference to nuclear power is not clear. Is he advocating electrification as one way of replacing the ponies; or does he mean that the saving of 30 million tons of coal a year would reduce to that extent the need for horses? Anyhow, he has drawn attention to the necessity for speeding up the conversion of this form of traction.

* * *

A fire causing extensive damage occurred in an Ilkeston (Derbyshire) furniture shop recently. It was reported by the *Yorkshire Evening Post* that a fire prevention officer expressed the opinion that the fire arose from the red hot filament of a fractured electric lamp falling on to some packing and igniting it. I am used to seeing fires attributed to "the fusing of an electric wire" but this is new to me. Am I justified in being a little sceptical?

* * *

A couple in Hampshire, whose story is told by the *Evening News* (Portsmouth), acquired a very dilapidated mill house and set about turning it into a home. The electrical installation had to be renewed and then for a time the only means of cooking was "an electric radiant ring." Naturally, one would have thought, electric cooking would have been decided on, if only in gratitude for this emergency service. But no; the account goes on to say that "a new range-cooker, a gas cooker and sink unit were installed." How unwise this decision was is underlined by a suggestion that some of the mill machinery may be restored. That would give an opportunity for putting in a small hydro-electric set (it is a water mill) to provide electricity for the house. So why a gas cooker?

* * *

Frequently at agricultural shows the electricity supply contractors are worried by travelling cranes whose jibs catch up on overhead lines and pull them down. At the recent Royal Show at Bristol (I am told by Dale Electric (Yorkshire), Ltd.) it was a crane which came to grief in an encounter with one of their overhead lines. Unknown to the driver the jib caught the wire while the vehicle on which the crane was mounted continued on its way. The line held and the crane, with the vehicle, was pulled over backwards. Fortunately, nobody was hurt. There was a mid-span joint in the line so obviously the jointers had made a good job of it.

* * *

Remote control of electrical plant is a commonplace to-day, but I doubt whether control has ever been so remote as the *Daily Worker* reports of the Kuibyshev hydro-electric station on the Volga. It is said that "the whole of this mighty power station is operated by one man sitting at a control desk 600 miles away in Moscow"; the capacity is 2,100 MW. The *Daily Worker*, which is naturally prouder of Russian than British achievements, says of the turbo-generators:—

> "They are also the most efficient, with a co-efficiency of about 95 per cent. When they were built they were designed for a capacity of 105,000 kW a day. Tests have now shown that each turbine will now generate 126,000 kW."

* * *

One of the Graduate and Student Sections of the Institution of Electrical Engineers has notified its members of a visit to another Section. From the details given I should think that it will be a most enjoyable outing at a very reasonable cost. In fact everything seems perfect except the heading of the printed notice: "The *Institute* of Electrical Engineers."

* * *

One original purpose of the British Association for the Advancement of Science was to acquaint the public with what was going on in the scientific world. For years now it has been said that this object is rarely achieved. Many of the papers presented in the various sections are directed at specialists and are far from "popular." Perhaps because of this the lay Press gives attention to the more "sensational" rather than the more fundamental papers. It was the same eighty years ago when the *Electrical Review* (1st September, 1878) referred to:—

> "Groups of men and women who wander aimlessly from section to section eager to find something they can understand to carry away with them. . . . Hence it comes to pass that when Sir John Lubbock discourses on ants, or Captain Burton on the land of Midian, or Miss Todd on the boarding out of pauper children, such sections become inconveniently crowded, full newspaper reports appear, and the public go away with the impression that such papers have been the chief events of the meeting."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

A. H. Hunt (Capacitors), Ltd., has announced that it has agreed to relieve **Mr. F. S. Richmond,** at his own request, of the responsibility of deputy managing and sales director in view of his approaching retirement age. Mr. Richmond will remain on the board as a full-time executive director and his advice and experience will remain available both to the company and within the trade. **Mr. W. F. B. Nott,** who recently joined the company as commercial director, has assumed responsibility for sales.

Miss Kathleen A. Gough, B.Sc., chief physicist of the Dubilier Condenser Co. (1925), Ltd., has been elected a full corporate member of the Institution of Electrical Engineers. Miss Gough was educated at the Wallington County School for Girls and having obtained a pass to the intermediate examination of the London University she completed her academic education at University College, London, where she read physics for her degree course. Miss Gough is well known in the field of dielectric research; she is a member of several E.R.A. Committees and in her capacity as chief physicist of the Dubilier Condenser Co. has, for many years, been responsible for much development and experimental work on capacitors. She is also a Fellow of the Institute of Physics, a member of the Women's Engineering Society and the author of several technical articles and papers.

Miss K. A. Gough

Mr. L. W. Bower, senior assistant commercial engineer to the North Western Electricity Board at Manchester, has been appointed commercial officer in the No. 2 (Huddersfield) Sub-Area of the Yorkshire Electricity Board, in succession to **Mr. G. Sheppard.** Mr. Bower will take up his new appointment early in September.

British Transport Docks announces that **Mr. E. S. Ely,** M.I.Mech.E., M.I.E.E., docks mechanical and electrical engineer, Southampton Docks, will retire on 31st August. As a result of reorganisation, **Mr. J. H. Jellett,** O.B.E., M.I.C.E., docks engineer, Southampton Docks, has been appointed chief docks engineer as from 1st September, in which capacity he will be responsible for the control of the whole of the civil, mechanical and electrical engineering organisation at Southampton Docks.

Mr. Ely commenced his career at Southampton with the London & South Western Railway Co.; after serving with the Forces in the 1914-18 war he obtained experience with various engineering firms, returning to the Electrical Engineer's Department of the former Southern Railway at Southampton Docks in 1928 as an engineering draughtsman. He was appointed assistant electrical engineer, Southampton Docks, in 1940 and electrical engineer in 1943, taking an active part in the development of schemes for the improvement of mechanical and electrical equipment at the ports of Southampton, Newhaven, Folkestone and Dover, and for electrical equipment in the cross-Channel steamers. In 1951 he became docks mechanical and electrical engineer, Southampton Docks. He was chairman of the British Transport Commission (Docks) Mechanical and Electrical Engineers' Committee, and served on the committees of the former Hampshire Sub-Centre and the Southern Centre of the Institution of Electrical Engineers.

Mr. Jellett was educated at Shrewsbury and at Gonville & Caius College, Cambridge, where he graduated with first-class honours in the mechanical sciences tripos. Following a pupilage with Rendel, Palmer & Tritton, he was retained by that firm as an assistant engineer and was subsequently appointed by Sir Robert Elliott Cooper as assistant resident engineer on the reconstruction of the Warwickshire section of the Grand Union Canal. In 1933 he joined the staff of the Civil Engineer-in-Chief of the Admiralty and held several senior posts. For six months from D-Day he was the Civil Engineer-in-Chief's representative on the construction of the "Mulberry" harbour at Arromanches, with the rank of captain, R.N.V.R. Mr. Jellett was appointed by the Southern Railway Co. to be deputy docks engineer at Southampton in 1946 and succeeded Mr. M. G. J. McHaffie as docks engineer in 1948.

Mr. P. W. Townsend, managing director of the Kempston Electrical Co., Ltd., sailed last week to the United States in connection with the importation and distribution of electrical control equipment and the possible manufacture of additional apparatus in this country. At the present time the company imports from about fifty manufacturers in the United States.

Mr. D. A. Laverack has been appointed area manager at new area offices for Yorkshire established by the Electric Construction Co., Ltd., at Bushbury House, 4, Low Mount, St. Mary's Road, Leeds, 7. Mr. Laverack has been responsible for the company's interests in Yorkshire for twenty-five years. He will be assisted by **Mr. E. J. Haslock,** A.M.I.E.E., formerly branch manager for the Hackbridge and Bryce companies.

Mr. L. A. Mills has been appointed deputy manager of the Osram Lamp Department of the General Electric Co., Ltd. Mr. Mills has been on the staff of the department since 1928 except for service in the Royal Artillery during the last war. He has been closely concerned with the marketing arrangements for "Osram" lamps and tubes in the United Kingdom for many years, latterly as an assistant manager.

Mr. L. A. Mills

Mr. G. J. Brown, who is in charge of the switchboard of R. B. Pullin & Co., Ltd., has completed twenty-one years' service with the company and to mark the occasion Mr. P. J. Ellis, managing director, has presented him with an inscribed Braille gold hunter watch. Mr. Brown lost his sight in the 1914-18 war and received his training as a telephonist at St. Dunstan's.

Mr. T. Coughtrie, chairman and managing director of Belmos, Ltd., has joined the board of Bruce Peebles & Co., Ltd.

Mr. A. W. Stannett, B.Sc., A.M.I.E.E., and **Mr. D. H. Shroff,** B.Sc., Graduate I.E.E., joint authors of the article on "High Voltage D.C. Cables" (page 364), are on the staff of the Central Electricity Research Laboratories.

Mr. Stannett worked with W. T. Henley's Telegraph Works Co., Ltd. (Research Department), for nine years on insulating materials used in the

Mr. A. W. Stannett

Mr. D. H. Shroff

cable industry. Under the Henley Education Scheme he gained, in 1944, a City and Guilds full technological certificate and a London University external B.Sc.(Eng.) degree, being the first student of Dartford County Technical College (now the North West Kent College of Technology) to achieve this. He joined the B.E.A. (now Central Electricity) Research Laboratories in 1949 and since then has worked on dielectrics and insulating components used in the supply industry, principally insulating oil, condenser bushings, switchgear components and cables.

Mr. Shroff qualified for the Diploma in Electrical Engineering of Surat Polytechnic, India, in 1947. After serving for three years with the Tata Hydro-Electric Power Supply Co., Ltd., Bombay, he joined the B.E.A. (now C.E.G.B.) as a graduate trainee in 1952 and by part-time study at West Ham College of Technology obtained a degree in engineering of the University of London. He spent two years on electrical maintenance work at the Brunswick Wharf generating station, and in 1956 he joined the staff of the Authority's Research Laboratories at Leatherhead on work associated with insulation of electrical components.

Mr. F. C. Orchard, M.I.E.E., A.M.I.Mech.E., M.I.B.A.E., at present commercial officer of the Chilterns Sub-Area of the Eastern Electricity Board, is the manager-designate of the Fens Sub-Area to succeed **Lt.-Col. A. E. Knights,** who is retiring at the end of the year.

Mr. F. C. Orchard

Mr. Orchard was born in Birmingham and was educated at the Handsworth Technical College. He held various positions with the Birmingham Electricity Supply Department between 1923 and 1935. He was chief engineer and manager for the Hornsey Electricity Department from 1935 to 1947 and held a similar position with the Watford Electricity Department until the nationalisation of the industry in 1948. Mr. Orchard is part author of "Generation, Transmission and Distribution of Electricity" (Pitman) and the author of "Mercury Arc Rectifier Practice" and "Electricity in the Building Industry" (Chapman & Hall) and he holds four patents on test and safety instruments.

Mr. J. F. Stott, chief installer at Liverpool for the Automatic Telephone & Electric Co., Ltd., has retired after thirty-nine years' service with the company. His first job was in the company's erection shops and he later joined the installation staff, working in many parts of the country. In 1925 he became head of installation in the London district, and was in charge of installation of the Mayfair, Grosvenor, Langham and Regent exchanges.

Mr. J. F. Stott (left) chief installer with the Automatic Telephone & Electric Co., Ltd., receiving presentations from Mr. G. Bennett, commercial manager, on his retirement

Later he returned to Liverpool, becoming chief installer. At a dinner in his honour held recently at the Strand Hotel, Liverpool, he was presented with a refrigerator and two gold watches—one for his wife.

Mr. N. D. Woolnough, service manager, Maldon, Essex, is relinquishing his position with the Eastern Electricity Board at the end of this month and sailing to New Zealand early in September. Mr. Woolnough commenced in the electrical contracting business in Norwich in 1917 and entered the supply industry in 1940 as consumers' engineer with the Rushden & District Electric Supply Co. Two years later he was engaged by the East Anglian Electric Supply Co. at Finborough Hall and in 1943 was appointed sales manager for Norfolk with that undertaking. In 1947 he became resident manager at Fakenham, Norfolk, and went to Maldon in 1951 to establish a branch office for the Eastern Electricity Board.

Mr. J. H. Harley, M.I.E.E., A.M.B.I.M., whose article "Lessons from France" appears on page 360, has been commercial manager, Llanelly District, South Wales Electricity Board, since 1950. He received his technical education at Leeds Central and Wolverhampton and Staffordshire Technical Colleges and, after a student apprenticeship, entered the supply industry in 1926 with the Yorkshire Electric Power Company. He was later with the West Midlands Joint Electricity Authority and was appointed engineer of the Shrewsbury District of the Midlands Electricity Board in 1948. Mr. Harley is a vice-president and past honorary secretary of the West Wales (Swansea) Sub-Centre of the I.E.E. and chairman of the vocational guidance committee of the Llanelly Rotary Club.

Mr. J. H. Harley

Mr. J. Radley has joined the Electroflo Meters Co., Ltd., to undertake work on electronic development in the Engineering Department. He was previously with Evershed & Vignoles, Ltd.

Captain R. L. Jordan, formerly engineer manager of the Royal Naval Dockyard at Chatham, has been appointed a director of Fawcett Preston & Co., Ltd., one of the Metal Industries group. **Mr. A. J. Taylor** has been appointed contracts manager of the company.

The Nuclear Power Plant Co., Ltd., announces the appointment of **Mr. R. D. Vaughan,** B.Mech.E., A.M.I.Mech.E., to the board. Mr. Vaughan has been chief engineer of the company for the past three and a half years.

Mr. R. D. Vaughan

Mr. J. L. Blue, A.M.I.E.E., superintendent of the Bonnybridge power station of the South of Scotland Electricity Board since 1948, has been appointed to succeed Mr. J. B. Lee as superintendent of Yoker power station, Glasgow.

OBITUARY

Mr. Herbert Woolliscroft Blades, M.I.E.E., who, until he retired in 1944, was engineer in charge of the Mains Department, City of Birmingham Electric Supply Department, died on 20th August at the age of seventy-seven. A native of Leek, N. Staffs., Mr. Blades was transferred in 1911 when the Borough of Aston Manor was incorporated in the City of Birmingham. He served for many years as chief assistant before being appointed mains engineer.

Mr. J. A. Gibson.—Wheeler Electrical Supplies (Wholesale), Ltd., inform us that their sales manager, Mr. J. A. Gibson, has died. He was well known to the company's customers in Derbyshire.

WILLS

Mr. F. I. Rice, founder and managing director of F. I. Rice (Electrical Contractors), Ltd., who died on 23rd February last, left £39,263 gross (£38,883 net).

Mr. G. A. S Harvey, late president of G. A. Harvey & Co. (London), Ltd., who died on 28th May last, left £44,560 gross (£42,032 net).

Mr. A. E. Smith, B.Sc., A.M.I.C.E., M.I.E.E., former director of Harry Astbury, Ltd., Birmingham, who died on 4th May last, left £19,956 gross (£19,710 net).

Mr. J. M. Brooke, managing director of Venner, Ltd., who died on 12th June last, left £11,714 gross (£10,560 net).

Engineering in Europe

ABSTRACTS FROM FOREIGN TECHNICAL JOURNALS

THE last section (Rheinau-Hoheneck) of the 380 kV transmission line between Rommerskirchen and Hoheneck in Germany was put into service in 1957. This has been a great technical achievement since the route of the line had to cross practically every kind of natural and artificial obstacle imaginable (hills and rivers, including the Rhine; agricultural and industrial districts; difficult ground for mast foundations, etc.). The line is a double-circuit one with quadruple conductor groups and double-transom towers. The transformer stations are equipped with interchangeable 660 MVA single-phase auto-transformer groups supplied by A.E.G., Siemens-Schuckert, and Brown-Boveri, with on-load tap-changers.

The equipment of the large switchyards at the line ends set a number of novel problems, not only where the switchgear itself was concerned, but also with respect to control and safety installations, earthing, etc. The smooth operation of the system so far shows that all these problems have been solved satisfactorily, which obviously also implies the correct layout and design of the relay and surge protection, insulation and its co-ordination, etc. Since the line plays an important role in inter-European power exchanges, power and voltage regulation has to be very sensitive. This is facilitated by up-to-date communication and tele-control installations. All these topics are comprehensively treated in special articles in this issue of the journal.—"The German 380 kV Transmission Line," Special Issue of *E.T.Z.(A)*, Vol. 79, No. 7, pp. 201-272, 1st April, 1958, in German.

Restriking Voltage

The usefulness of a short-circuit testing station for circuit-breakers is determined not only by the MVA of the short-circuit generator, but almost as much by the control range of the frequency of the h.f. component of the recovery voltage, i.e. the restriking transient. This control is mostly achieved by varying the natural frequencies of the test circuit, preferably by capacitor banks connected into the circuit.

The authors present a method of calculating the restriking voltage for the purpose of determining the required circuit parameters and configurations to produce it. This method is based on equivalent inductances and capacitances determined from the experimental relationship between natural frequencies of the circuit and additional capacitances connected. The main part of the paper reports the experimental investigation of the restriking voltage in the test circuit, based on more than 1,100 oscillograms obtained. These oscillograms enabled graphs of the natural frequencies as functions of the additional inductances, capacitances and test voltage to be plotted. The experimental results refer to single- and three-phase tests and show the restriking voltage in relation to the kV and MVA test ranges catered for by the testing station as equipped at present. A novel restriking-voltage indicator was used in which the conventional thyratons were with advantage replaced by germanium diodes.—"The Restriking Voltage in the Short-Circuit Testing Station of the H.V. Research Institute," H. Moravova and J. Panek, *Elektrotech. Obzor*, Vol. 47, No. 4, pp. 201-208, 1958, in Czech.

Power Plant Earthing

The complex problem of earthing large power stations or substations is simplified by the following facts: (a) in homogeneous grounds the earth currents are dissipated from driven ("point") electrodes in radial directions as though towards an imaginary hemispherical electrode of very large radius; (b) this corresponds to the theoretical field distribution between point electrode and hemispherical electrode; (c) it enables field distributions around individual earth electrodes to be considered and measured independently of return electrodes. Similarly, simple equivalent circuits may be devised to calculate contact and step voltages around earthed metal structures (towers, etc.), extended earths ("mats") and for the earthing circuits of overhead lines including earth wires.

It is clear that the calculations have to be checked and brought into line with actual conditions by measurements, for which many tried methods and special instruments exist. The authors present a comprehensive survey of the theoretical and experimental methods available and their adaptation to the character of the site and type of ground, and show the results of the application of these methods to the layout of the earthing system of the power station CONIEL at Bussolengo (Verona).—"The Earthing Systems of Large Power Stations," L. Forni and G. Livadiotti, *Energia Elettrica*, Vol. 35, No. 2, pp. 146-166, February, 1958, in Italian.

High-Voltage Cable Dielectrics

The h.v. performance of cables is intimately connected with the (mostly) inhomogeneous nature of their dielectrics. This fact mars likewise theoretical and experimental investigations on cable insulations; the former cannot but consider more or less idealised dielectrics and represent these by equivalent circuits, but not the actual insulating materials. Experimental workers, on the other hand, have to observe electric phenomena really taking place in micro-fields and their interaction with thermal and chemical changes of the dielectrics, as well as the interactions between the heterogeneous dielectrics themselves.

These disappointing conditions are surveyed and their physical background clarified in the introduction of the paper, which then summarises the characteristics of all the cable types used nowadays. The author then specifies the advantages of the oil-filled (Pirelli type) cable over the other types. The main danger eliminated is that of ionisation processes, since no voids or gas occlusions can form. The technical details of these cables and their installation are then fully described, with illustrations obtained during the recent laying of two lines of this type in Belgium. Degassing and pressurising equipment is shown, and jointing and sealing operations are described and illustrated. — "H.V. Dielectrics and Cables," J. Baudoux, *Bull. Soc. Belge Elect.*, Vol. 74, No. 1, pp. 15-28, January-March, 1958, in French.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Inadequate Wiring System

MAY I return to the question of multiple sockets and answer Mr. Raynor's question ?

In drawing attention to the New Day sockets (not socket) I did not recommend the installation of only one point per room; I think we are all agreed that this is ridiculous in these days. Mr. Raynor's hypothetical house owner should kick himself for not having had an adequate number of outlets installed in the first place and should have them put in.

I think Mr. Raynor has missed the point of the fused spur and complementary twin 2 A socket. One triple socket (1×13 A+2×2 A) on one side of the fireplace and a twin 2 A on the other will cover the majority of people's needs, for that is where I think most of the appliances are used. Another light-duty outlet on the far side of the room should cover pretty well anything. After all, most people need to use only one heavy appliance per room. The rest can adequately be carried by the 2 A plugs and by using the New Day triple socket and feeding the smaller one off the spur terminal; these could all be properly fused.

I may be starting another hare, but I must ask what proportion of 13 A plugs in use are properly fused. A very small one I would wager. I cannot understand why the fittings are invariably sold with 13 A fuses and have yet to hear a retailer ask what fuse a customer wants.

Surely the manufacturers could sell the plugs at a lower price without a fuse and leave the retailers to supply the correct one. Then, perhaps, we could start to get the general public educated to the use of proper fusing and gradually eliminate some of the horrible things that are done: for example, wrapping cartridge fuses in tinfoil instead of putting in new ones.

Redbourn, Herts. G. O. THACKER.

Receiving-Valve Performance

IN your issue of 11th July (page 62) there appeared a review of the book " The U.H.F. Performance of Receiving Valves." As an engineer who has read the book, I am, to say the least, surprised at some of the statements in the review. Contrary to the reviewer's opinion, I have found that this book has solved many of the problems that I encountered when trying to understand the performance of valves at high radio frequencies. Not only is it for the specialist but I am sure that it will be appreciated by electrical engineers generally. Llewellyn's monograph is undoubtedly excellent in its treatment of fundamentals, but it is surely much more suited to the mathematical physicist than to the engineer.

The reviewer's statement that the book is implicitly restricted to lumped element circuits is quite wrong. Lumped element circuits, cavities or any other realisation of the main part of a resonant circuit used with a valve can always be represented by a two terminal complex admittance at the (arbitrary) cross-section at which it is considered to be separated from the valve. The book (Chapter 8) gives the admittances on the valve side of this cross-section, and it is in no way limited to whatever is used on the other side. I also cannot agree that a book on the *performance* of receiving valves should include design data or discuss manufacturing techniques and problems.

The starting point of the book is a most effective representation of the valve as a circuit element in its own right, which characterises the valve by a set of admittances and transadmittances. Not only does this representation yield direct information on the u.h.f. signal and noise behaviour under any given external circuit arrangement, but it is used throughout to simplify the presentation of the analysis. This representation is something new and extremely valuable. It is not to be found in any other book. The failure of the reviewer to notice or comment on this point could rob many students and engineers possibly of an opportunity to gain a clear insight into the workings of a conventional valve at high frequencies.

Rickmansworth, Herts. H. GREGORY
(Chartered Electrical Engineer).

Professional Engineers' Conditions

THE views of the Engineers' Guild on the undesirability of chartered engineers taking part in collective bargaining are naturally of interest to those organisations, of which perhaps the Electrical Power Engineers' Association is an outstanding example, which have tried over very many years to establish adequate standards of remuneration for engineers.

Unfortunately the belief that the intrinsic value of the professional engineer is bound to be sufficient to ensure for him an adequate place in society has been proved wrong by the lessons of the last twenty years. His experience has been that of other professional people that the differentials to which their standard of training and the service they give ought to entitle them have been whittled away in favour of those who did not hesitate to use their power through the collective bargaining machinery.

In the electricity supply industry the engineers learned their lesson as long ago as 1913 which is in fact why the E.P.E.A. was created. Its continuous and continuing growth since then to the stage where 90 per cent of the technical staff in the industry are voluntary members (of whom about 40 per cent are qualified engineers) suggests that experience has endorsed the action taken then.

We welcome the support of the Engineers' Guild in every effort to obtain a full recognition of the value of the professional engineer to industry and the nation. We do not share their view that he should allow himself to languish in gentlemanly poverty while others by combined action through negotiating machineries improve their conditions of life. The butcher's bill has to be paid by the professional engineer as promptly as by anyone else.

London, S.W.1. H. NORTON,
General Secretary,
Electrical Power Engineers' Association.

I HAVE read your leading article of 15th August on the above subject. While I would be the last to discourage any association which strives to raise the status of engineers I must confess my doubts whether, under its present constitution, the Engineers' Guild can be of much

help to engineers. In fact, if its declared object is pursued of inducing members of the three institutions to withdraw from collective bargaining machinery it is likely to do untold harm. Why it should wish to do this I really cannot understand as I am quite convinced that so far as electricity supply is concerned collective bargaining has been of great benefit to engineers. Anyone who is familiar with conditions and remuneration thirty or forty years ago will confirm this as will, in fact, the columns of the *Review* which, to its credit, supported supply engineers in their struggle to improve their status and remuneration.

Incidentally, I do not understand why legislation should be necessary to enable professional engineers to withdraw from collective bargaining machinery. The majority can always do so if they wish, but the fact is they don't ! I have a suspicion that the Guild is gunning at the nationalised industries (so far as I am aware there is no collective bargaining for professional engineers in the manufacturing industry for reasons which are well known). If my surmise is correct then the Guild is likely to do a great deal of mischief. I have examined the main points in its programme, but they do not seem to me to be impressive. A survey of salaries in the engineering profession will no doubt produce interesting results, but what value will it have except for purposes of collective bargaining, which the Guild seems to dislike!

In my experience, engineers will expect from a body like the Guild the protection of their interests in respect of their employment and the discharge of their professional duties and responsibilities. Can the Guild offer this ? Really the Guild wants to do, without being in effect a trade union, what only a trade union can do! And, of course, it can't and I am sure that those who are its leaders would realise this if they new a little more about the history of associations both in the supply and manufacturing industries.

" SCEPTIC."

Lamp Publicity Campaigns

Posters at 4,400 outdoor sites throughout London and the provinces will head the publicity campaign of the General Electric Co., Ltd., for " Osram " lamps during the new lighting season. The displays will be integrated with the continuous display of illuminated signs, floodlit bulletin boards in main towns and cities and permanent signs at important railway stations throughout Britain. All the large bulletin boards and station signs, etc., will continue to display the " drummer boy " designed by George Him. The main poster campaign will display the " Osram " lamp family: father, mother and child looking out of a picture frame, designed by Jean Carlu. Advertisements, mainly in full colour, will appear in popular weeklies and in home and women's journals. The " Osram " " lamp family " design will be shown as a lithographed cardboard cut-out (13in by 9¾in by 4in) for display on counters or in windows. There will be three new window display units, each built of hardboard and wood, and bearing the slogan: " Use an extra Osram lamp. . . . Better lighting costs so little." The illustrations are in mezzotint; one shows a " teenage " girl seated at her dressing table, another shows a small child switching on a light; and the third bears an illustration of a man sitting reading by the light from a wall lamp.

A new Osram "Better Lighting" display unit

The displays, which measure 3ft by 2ft, will be installed by the company's dealer service for periods of fourteen days. Two larger displays on the same theme (6ft long, extending to 9ft) will be available for installation in Electricity Boards' and other large windows. They incorporate shelves for displaying lighting fittings. Another new sales aid will be an illuminated " Perspex " sign for counter or window display, which will be supplied with lampholders and 6ft of flexible. The translucent " Trapinex " transfer will continue to be supplied.

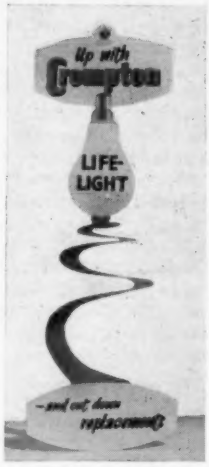
Advertisements for industrial and commercial users of fluorescent tubes will appear in daily, weekly and trade papers. Separate advertising campaigns will help promote sales of lamps for street lighting, photography and vehicle bulbs. For car bulb stockists an illuminated counter or window sign will be available.

The campaign will be supported by literature, including a new catalogue containing details of lamps and tubes for all lighting purposes, a small leaflet describing the range of lamps and tubes for domestic use, separate price booklets for lamps and tubes, vehicle bulbs, and a catalogue of photographic bulbs and equipment.

Crompton Plans

Crompton Parkinson, Ltd., are launching a television advertising campaign in the autumn for their lamps. This will be supported by Press advertising in selected areas and a wide variety of new point-of-sale display material for stockists. The television campaign, for which a gay, 15-second live-action film has been produced, features, in particular, the longer life that can be expected from the Crompton " Life-Light " range of lamps. In slogan form, " Up with Crompton Life-Light—and Cut Down Replacements," this theme is expressed in all the advertising and dealer aids.

The new suspended display device for stockists of Crompton lamps



For the use of stockists, the display material includes a bold cut-out showcard that lends itself to counter, window or wall display; a new idea in suspension type displays by way of a spiral cut-out that rotates and tends to float in the air currents; and a metal counter dispenser. A new counter price list for purchasers has been produced and, as aids for sales assistants, there are catalogues, price cards and pocket price lists. New reference literature and a wall chart are also available in respect of car bulbs; for this subject, special advertising is to be directed at the motorist. Other advertising, additional to that already referred to, is to be directed at industrial lamp users.

INDUSTRIAL NEWS

Calder Hall Turbine Accident

A report has now been issued by the Board of Enquiry set up under the chairmanship of Mr. P. T. Fletcher (deputy managing director of the Industrial Group of the United Kingdom Atomic Energy Authority) to investigate the cause of the destruction through overspeeding of a 23 MW 3,000 r.p.m. turbo-alternator at Calder Hall "B" nuclear power station (see *Electrical Review*, 5th July). On 28th June, when shutting down a reactor, the operating governor and the emergency governor coincidently failed to control the steam supply to the turbine, which consequently ran away. Fragments of chilled iron shot, which were found in the steam system, had jammed the two stop valves, thus preventing their automatic reclosure. Since the reactor is quite separately housed, there was no risk of release of radio-activity. The Board of Enquiry made twelve recommendations for the purpose of preventing a recurrence of such a mishap.

Combustion Engineering Association Conference

A conference will be held by the Combustion Engineering Association on 11th and 12th November next at the Royal Hotel, Scarborough. The first day will be devoted to an examination of the fourth annual report of the National Industrial Fuel Efficiency Service and to analyse the findings of N.I.F.E.S. in its work with industry; to highlight the inefficiency which has been found in the use of fuel and, at the same time to show where the greatest savings can be made and how they can be most easily accomplished. Details of the second day will be announced shortly.

Engineering Unions' Equal Pay Claim

Last week the Amalgamated Engineering Union, the Electrical Trades Union and three other unions with members in the engineering industry put in a claim for women employees to be paid at the same rates as men.

Electric Traction

Photographs and brief specifications of many electric and diesel-electric locomotives and motor coach trains supplied by the English Electric Co., Ltd., for service in this country and abroad are given in the latest edition of "English Electric Traction." Details of recent orders are also included.

Factory Exhibition Conference

Six conferences will be held in conjunction with next year's Factory Equipment Exhibition. They will take place on eight of the ten days (7th to 17th April) during which the exhibition will be open at Earls Court, London. The subjects covered will be finance for industry, clean air, heat and sound insulation, productivity and materials handling. The British Productivity Council and the Institute of Materials Handling have been invited to organise programmes and committees are being convened to arrange the other conferences.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton	£180 0s 0d
COPPER, H.C. Electro	ton	£204 2s 6d
Fire Refined 99·70%	ton	£203 0s 0d
Fire Refined 99·50%	ton	£202 0s 0d
COPPER Tubes ..	lb	1s 11½d
Sheet	ton	£232 10s 0d
H.C. wire and strip ..	ton	£250 5s 0d
LEAD, English ..	ton	£70 6s 3d
Foreign	ton	£69 0s 0d
MERCURY	flask	£79 0s 0d
TIN, block (English) ..	ton	£730 5s 0d
ZINC, G.O.B. Foreign	ton	£64 2s 6d
BRASS Tubes (solid drawn)	lb	1s 7½d
Wire	lb	2s 4½d
PHOSPHOR BRONZE Wire	lb	3s 10½d
PLATINUM	oz	£23 5s 0d
RUBBER, No. 1 R.S.S. spot	lb	23¾d—24d

Oil Equipment for Brazil

At the invitation of the Brazilian Government oil monopoly, "Petrobras," representatives of a British consortium of oil equipment manufacturers recently visited Brazil to negotiate for the supply of equipment for a new refinery to be constructed near Rio de Janeiro. Foster Wheeler's are retained by "Petrobras" for the design, engineering and supervision of the refinery. The consortium, which was formed through the ægis of the Council of British Manufacturers of Petroleum Equipment, is the British Refinery Constructors, and is known as "BREFCON." It includes the principal United Kingdom manufacturers of oil refinery equipment and allied products.

"BREFCON" is headed by Babcock & Wilcox, Ltd., the British Thomson-Houston Export Co., Ltd., Stewarts & Lloyds, Ltd., and John Thompson, Ltd.; Balfour, Beatty & Co., Ltd., are acting in a secretarial and co-ordinating capacity. As a result of the negotiations in Brazil the "BREFCON" representatives received from "Petrobras" a contractual letter of their intention to purchase a minimum of £4 million worth of equipment for the new oil refinery from "BREFCON." There had been French, German and Italian competition.

New T.V. Link for Orkneys

The B.B.C. has recently placed a contract with E.M.I. Electronics, Ltd., for a temporary microwave radio link to serve the new transmitting station in the Orkneys so as to bring television to people living in the Kirkwall area nearly a year sooner than would otherwise have been possible. The link will relay the B.B.C.'s programmes from a site near Wick to the new broadcasting station at Nether Button in the Orkneys. This station is due to be brought into service in a temporary condition early in 1959 and will eventually carry a full v.h.f. sound and television service.

Large Transformer for Scottish Station

On 15th August Bruce Peebles & Co., Ltd., despatched the first of three 144 MVA 13·8/145 kV generator transformers to the Kincardine-on-Forth power station of the South of Scotland Electricity Board. This is the highest rating of any transformer yet built for connection to the 132 kV or 275 kV grid systems. Because there was no adequate through road between the Bruce Peebles works and the power station the transformer had to go to Leith by road for shipment to Rosyth Dockyard where the Admiralty permitted the use of the 250-ton crane. A major factor in the design of the transformer was the necessity to limit the transport weight to within 120 tons, the maximum lift which could be handled at Leith. For transport the transformer was drained of oil and

144 MVA transformer being loaded on to the Gibson ship "Heriot" at Leith

filled with dry nitrogen. It was carried over land on a 24-wheeled trailer powered by two 240 h.p. tractors. At Kincardine-on-Forth the transformers will link the 120 MW turbo-alternators to the 132 kV grid system.

Materials Handling Convention

The Materials Handling Group of the Institution of Production Engineers is holding a three-day convention at the Hotel Metropole, Brighton, from 13th to 15th October. The theme will be "Finding the Practical Solution" and will take the form of team investigations of actual handling problems offered by engineering firms in Sussex. Visits will be made to a wide range of industries to study specific handling problems, and these will be followed by discussions in syndicates and groups. On the evening of Monday, 13th October, the Mayor of Brighton will hold a civic reception for delegates at the convention headquarters. Applications to attend should be made to the secretary, Materials Handling Convention, 10, Chesterfield Street, London, W.1, by 30th September.

New Truvox Premises

New factory and office premises have been opened by Truvox, Ltd., at Neasden Lane, Harrow, Middx., where all departments are now housed, except the Service Department and the electric motor manufacturing section which remain at the Harrow factory. The new main building covers an area of 36,000 sq ft and has been so constructed that an additional storey can be added when required. The Development Department and canteen are housed in adjoining buildings. The company has established a service centre in Scotland.

Aluminium Alloy Conductors

Recommendations for an international specification for aluminium alloy conductor wire containing approximately 0·5 per cent each of magnesium and silicon have been issued as Publication 104 (1·5 Swiss francs plus postage) by the International Electrotechnical Commission, 1, rue de Varembé, Geneva. The document prescribes the electrical resistivity as measured within a stated temperature range, tensile strength and elongation before stranding.

Pole-Amplitude Modulation

An error occurred in the above article in our issue of 22nd August. On page 324 the first sentence under the sub-heading "Method of Modulation" should read "In its simplest form pole-amplitude modulation is obtained by reversing the whole of the second half of each phase winding with respect to the first."

Electrotechnical Vocabulary

As part of a second edition of the International Electro-Technical Vocabulary, the first edition of which was issued in 1938 and is now out of print, the International Electrotechnical Commission, 1, rue de Varembé, Geneva, has published at 6 Swiss francs a document (ref. 50 (35)) dealing with electro-mechanical applications. It contains about 90 terms and definitions in English and French and equivalent terms in six other Continental languages with indices for each. Terms and definitions are divided into the following sections relating to different applications: general; lifting, handling and conveying; miscellaneous; domestic; automobile; agricultural; clocks; signalling devices. When complete the Vocabulary will consist of 24 groups.

New "Atlas" Reflector Tubes

The "Atlas" range of internally coated reflector fluorescent tubes has been augmented by the addition of 5ft 50 W (1in dia.) and 8ft 125 W sizes in "white" and "warm white" (quick-start grades). The 8ft tubes are available with either bi-pin or b.c. caps and the 5ft 50 W tubes with bi-pin caps only.

Country House Electrical Installations

The Trustees of the Chatsworth Settlement have accepted a tender of Blackburn Starling & Co., Ltd., Nottingham, for a new electric lighting and power installation for the private apartments at Chatsworth House, Derbyshire, the home of the Duke and Duchess of Devonshire. The work, which is proceeding, is being carried out under the supervision of Messrs. C. MacKechnie Jarvis & Partners, consulting engineers.

Rubber Production and Consumption

During the first half of this year the production of natural rubber totalled 805,000 long tons and consumption 950,000 tons. Stocks at the end of the period were 65,000 tons lower than at 1st January. Synthetic rubber production during the six months amounted to 565,000 long tons and consumption to 582,500 tons, stocks at the end of the period showing a reduction of 20,000 tons. These figures were provided by the Secretariat of the International Rubber Study Group, Brettenham House, Lancaster Place, London, W.C.2.

First Locomotive for Durgapur

A 31-ton diesel-electric locomotive left Sheffield on 25th August for shipment on the cargo ship s.s. *Masirah*. It is destined for Durgapur, West Bengal, the site of the steelworks being built for the Government of India by the Indian Steelworks Construction Co., Ltd., a consortium of British companies. Made by the Yorkshire Engine Co. for the British Thomson-Houston Co., Ltd., one of the four major electrical companies supplying electrical equipment for Durgapur, it is the first of ten 31-ton diesel-electric locomotives to be shipped by the end of this year. A further thirteen diesel-electric locomotives of 72 tons each will be needed later on. During the coming year the ten 31-ton locomotives will be used on the site on construction work. After 31st October, 1959, some of them will be shifting over to work in the steel plant itself, and by 31st July, 1961, when the steelworks at Durgapur will be completed, the twenty-three locomotives will be used on the 70 miles of new railway track inside the plant.

The first 31-ton diesel-electric locomotive for the Indian Steelworks Construction Co., Ltd.

City and Guilds

The General Regulations of the City and Guilds of London Institute for the 1958-1959 session are now available from Gresham College, Basinghall St., London, E.C.2. A booklet giving regulations and syllabuses for telecommunication and electrical subjects is also available (4s 6d, post free).

The Institute's syllabuses and examination schemes are constantly under review and a section of the annual report (price 2s 3d, post free) gives details of new examination schemes and revisions introduced during the year. The report states that 61 per cent of the total number of candidates for all examinations passed; of these 31 per cent received a second-class pass.

Guide to Broadcasting Stations

The "Guide to Broadcasting Stations 1958-59," compiled by and published for *Wireless World* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1 (price 2s 6d net, by post 2s 11d), is now available. Well over half the medium- and long-wave broadcasting stations in Europe are operating on frequencies not allocated to them at the Copenhagen International Conference of 1948. These stations, numbering about 470, are

italicised in the Guide which lists both geographically and in order of frequency some 750 European medium- and long-wave transmitters.

Operating characteristics (frequency, wavelength, power and call-sign) for well over 2,000 short-wave broadcasting stations of the world are tabulated in order of frequency and stations are also listed geographically. Carrier frequencies of v.h.f. sound broadcasting and television stations in the United Kingdom are also listed. The list of broadcasting stations has been revised and many hundreds of additions and amendments have been made. The carrier frequencies given have been checked against measurements made at the B.B.C. Receiving Station, Tatsfield, Surrey.

Scottish Electro-Heat and Productivity Conference

The South of Scotland Electricity Board will hold an electro-heat and productivity conference and exhibition in Kelvin Hall, Glasgow, from 10th to 14th November. This will be the first of its type organised in Scotland. It will cover all aspects of industrial electric heating, including process heating, furnaces and ovens, welding and space heating; also associated equipment in the field of instrumentation, testing controls, mechanical handling, etc. The conference sessions, of which there will be two each day, will be addressed by experts in the field of industrial electro-heating. Most of the leading manufacturers concerned have announced their intention to exhibit.

Instrument Company's New Works

Texas Instruments, Ltd., Bedford, is to erect a new factory at Hoo Farm, Bedford, which will have an area of 240,000 sq ft. The building will incorporate the same hyperbolic paraboloid and space frame structure as in the Dallas plant of Texas Instruments, Inc. This is a thin-shell concrete umbrella forming the roof which produces a readily expandable structure with wide areas of uncluttered floor space.

Cheaper Heavy Water

A claim to have evolved a method of producing "heavy water" at a much lower cost than by previous processes has been made by Constructors John Brown, Ltd., a subsidiary of John Brown & Co., Ltd. Heavy water is employed as a moderator in nuclear reactors and the present price quoted by the United States (from which supplies are obtained) is $28 per lb.

It is understood that Constructors John Brown, Ltd., does not propose to produce heavy water itself but is prepared to build the necessary plant.

Birmingham Engineering Centre at Lisbon

At the request of the Federation of British Industries, the Birmingham Engineering Centre is to organise a group stand at the British Trade Fair in Lisbon which will be held from 29th May to 14th June next year. The stand will be organised on similar lines to that at Brussels, the Engineering Centre arranging the construction of the stand, publicity, display, etc. Inquiries regarding space cost, etc., should be made to the general manager, Birmingham Engineering Centre, Stephenson Place, Birmingham, 2.

Swedish Nuclear Power Programme

At the annual general meeting of the British-Swedish Chamber of Commerce in Sweden on 18th September in Stockholm, there will be a public meeting devoted to reviewing nuclear energy achievements and applications in the United Kingdom and Sweden. The principal British speaker will be Sir Claude D. Gibb, chairman and managing director of C. A. Parsons & Co., Ltd., and the Nuclear Power Plant Co., Ltd. His talk will be followed by the new colour film of the Bradwell nuclear power station. On the Swedish side, Mr. H. Brynielsson, managing director of AB Atomenergi, will review the Swedish atomic energy programme and Sweden's import requirements in this connection. His talk will be illustrated by slides on nuclear energy developments in Sweden.

Ironstone Mines Regulations

Draft regulations have been circulated by the Ministry of Power, the effect of which will be to specify separately the qualifications of persons appointed to certain electrical and mechanical posts at ironstone mines. At present the requirements are the same as for coal and other mines. The Mining Qualifications Board will be empowered to issue certificates for mechanical and electrical engineers and for mechanics and electricians limited in their validity to ironstone mines. The regulations set out the requirements relating to training and experience and to engineering qualifications. Copies of the Draft Coal and Other Mines (Mechanics and Electricians) (Variation) Regulations, 1958, can be obtained from H.M. Stationery Office, price 4d.

Educational

The L.C.C.'s annual guide to evening classes ("Floodlight") is now on sale (price 6d). It is in an attractive blue cover displaying an aerial view of London with a floodlight on County Hall. Among the subjects for which courses are available are nuclear physics, aeronautical and television engineering, industrial electronics, smoke abatement, transistors and trade union studies. Enrolment week begins on 15th September. The guide gives the addresses of all the various colleges and institutes.

The London and Home Counties Regional Advisory Council for Higher Technological Education has issued Part I (autumn term), of its "Bulletin of Special Courses in Higher Technology" held in the London and Home Counties region. Part II (spring and summer terms) is published in December. Copies of each part are obtainable (3s post free) from the Secretary, Regional Advisory Council, Tavistock House South, Tavistock Square, London, W.C.1.

The prospectus of part-time day and evening courses at the Northampton College of Advanced Technology, London, for the session 1958-59 is now available from the secretary of the College, St. John Street, London, E.C.1.

Change of Name

On 1st September the **Hotpoint Electric Appliance Co., Ltd.**, will change its name to **A.E.I.-Hotpoint, Ltd.**

Trade Announcements

From 1st September the Advertising Department of **W. T. Henley's Telegraph Works Co., Ltd.**, will be at the company's head office at 51-53, Hatton Garden, London, E.C.1 (telephone: Chancery 6822).

The executive offices of **Kelvin & Hughes, Ltd.**, have been transferred to Empire Way, Wembley, Middx. (telephone: Wembley 8888).

Webster Wood Products has acquired the activities of the Electrical Woodware Department of the West London Timber & Moulding Co., Ltd., and will, for the time being, be operating from Herbert Gardens, Thames Road, London, W.4 (telephone: Chiswick 6737). Mr. T. E. Webster has left the West London Timber & Moulding Co. to devote the whole of his time to Webster Wood Products.

The district offices and stores at College Street, Northampton, of the **A.E.I. Lamp & Lighting Co., Ltd.**, are closing to-morrow (Saturday) and thereafter all deliveries and services will be from the office at 5, Campbell Street, Leicester (telephone: Granby 291).

The London sales office, sales and service staff of **Elcontrol, Ltd.**, have been transferred to the company's works at Wilbury Way, Hitchin, Herts. (telephone: Hitchin 2411).

The London sales office of **Brook Motors, Ltd.**, has been transferred to larger and more convenient offices at 1-2, Finsbury Square, E.C.2 (telephone: Metropolitan 9401/7; Telex: Brookmot Phone London Telex 2-2142).

G.W.B. Furnaces, Ltd., has appointed Sheppard & Sons, Ltd., Bridgend, Glamorgan (telephone: Bridgend 567), to represent it in the South Wales area for the sale of the G.W.B. range of low voltage control gear from 10 to 1,400 A a.c. or d.c. and for complete centralised control systems and panels.

National Radio Exhibition

This year's show is remarkable for a revived interest in sound radio, largely because of the advance in stereophonic sound production and v.h.f. receivers. Much is being done to make servicing easier by the use of printed circuit panels and by other means. In television sets the 17in. screen is the most popular and manufacturers are aiming at shorter cathode ray tubes

EXAMPLES OF MODERN TRENDS

AT the twenty-fifth National Radio Exhibition, which opened on Wednesday at Earls Court, London, and runs until 6th September, television takes second place, while sound reproducing equipment, which a few years ago was considered to have reached such an advanced stage that no further progress was likely to be made, steals the show. It is appropriate to the circumstances that for the first time in its history the Exhibition includes an Audio Hall in which sound reproducing equipment of all types can be demonstrated in sound-proof rooms.

A big change took place with the introduction of negative feed-back, which revolutionised the design of electronic amplifiers. It enabled distortion that was accepted as inevitable to be eliminated, vastly improving the quality of musical reproduction and opening up a new field of interest.

What gives sound reproduction its ascendancy at this year's show is the introduction of "stereophony," which gives added realism to the already high quality that modern amplifiers can offer. To appreciate the difference that "stereophony" makes it is necessary only to hear it demonstrated.

Stereophonic ("stereo" for short) reproducers use two loudspeakers, or speaker systems, instead of one, spaced apart, and when they are fed from two separate amplifiers with a stereo signal, their combined sound gives an indication of the directions from which the sounds originate, and the source, instead of being limited to a hole in a cabinet, is spread out across the room.

Thus a moving object such as a train or a car, for instance, can be heard to travel across the room, and many stereo demonstrations take this very spectacular form. The real value of stereo, however, lies in the impression of spaciousness it gives when reproducing an orchestra. The directional effect may be only subconsciously appreciated, but the realism is remarkable.

Stereophonic reproduction is not a new idea, but in the past it has been difficult to achieve, mainly for technical reasons, but also on account of the cost, involving as it does the duplication of the entire reproducing system. Tape recording made it possible domestically, but few gramophone record users were prepared to go to the trouble and expense that was involved. The great revolution that has enabled stereo to be launched as a medium for domestic entertainment is the development of the stereophonic disc gramophone record and a suitable pick-up, which is an outstanding technical achievement. The record is played like an ordinary long-playing record.

Practically every exhibitor at the show who features record reproducers or radiograms includes stereo equipment. And this is not confined to what is termed "Hi-Fi" equipment; it ranges from the small portable record player upwards. It might appear from the need to employ twin amplifying channels and speakers that stereo equipment must necessarily be very expensive, but the prices start off at twenty guineas for a complete outfit.

The equipment is offered mainly in three forms. What might be termed the conventional approach is to use a control unit, containing the amplifiers and record turntable, and two separate "satellite" speakers. In a high quality outfit the speakers might both be multiple-speaker systems with bass and treble units which, with two high quality amplifiers, would be fairly expensive. A second method, which is less convenient in some ways but is very much cheaper, is to house one speaker in the

New line in table radio cabinet design. Top: Philco model 100 "Century" A.M./F.M. receiver; above: Ferguson model 388A "Futura", also A.M./F.M.

control unit, which therefore must stand where the speaker is situated. This is usually in one corner of the room, while the second, or satellite, speaker is in the opposite corner on the same wall.

Either of these methods might be used in equipment designed from the outset to be stereophonic. The third form is usually employed to convert or adapt a monaural (or monophonic) instrument to stereo. One speaker is then the original instrument, which may be a conventional radiogram with special arrangements to permit conversion. The second, or satellite, speaker includes an amplifier which is housed in its cabinet, and this provides the second channel. With this and a stereo pick-up to replace the original one, provided that the wiring is present, the complete equipment becomes stereophonic.

In either of the last two forms, of course, if the satellite speaker is disconnected a complete conventional record reproducer remains, with its self-contained speaker, as in a conventional radiogram. With any of them, however, a mono record can be played without changing the arrangement in any way, because the stereo pick-up will play ordinary l.p. records, feeding an identical (not stereo) signal to each channel. The same applies to radio. Turn-over pick-ups are made which are stereo on one side and 78 r.p.m. on the other, so that any kind of disc record can be played.

A fourth form in which stereo is offered, by at least three manufacturers, is a complete system, but with both channels, including the two speakers, in one cabinet. The separation of the speakers, which is an essential feature of stereophony, is achieved by placing them at opposite ends of a large cabinet three or four feet apart. By fitting them on hinged doors, one firm manages to space them six feet apart.

Such an arrangement has the advantage that it does not require a satellite speaker at some inconvenient position in the room, although to people who are supposed to "know" this is heterodoxy; yet it surely must work because otherwise manufacturers would not produce it. Presumably, the phase difference between the two channels has a greater effect than the difference in volume.

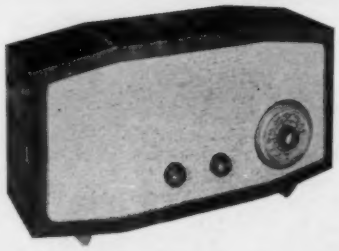
Speaker Arrangements

Portable stereo players may have one speaker in the case, and one in a removable lid; or their fixed speaker in the lid, and a demountable one clipped into the lid beside it. Another arrangement is to hook both speakers on to the sides of the case, with their faces angled outwards to spread the sound, with the alternative of lifting off the speakers and extending them as satellites to the corners of the room.

It is a feature of stereo theory that the bass notes have little stereophonic effect, and one manufacturer takes advantage of this to achieve good bass response at a moderate price. His bass speaker system is housed in the control unit, which is available as a player or as a radiogram, and works up to 300 c/s only. The middle and top frequencies are handled by two satellite speakers, but these are quite small. In practice, they take the form of plaques which can be hung on the wall or stood on furniture, and they produce the stereophonic effect. The main instrument can be situated almost anywhere in the room and provide the bass, while the plaques can easily be stood wherever acoustical requirements dictate.

The design of radio and television receivers seems to have settled down to a steady pattern, and although we expect new and spectacular development to be revealed each year at the show, it is a heartening sign that design

Kolster-Brandes 17in "Royal Star"



The "transistorised" portable shown above (the "Gayplay") weighs only 22 oz and measures 2in x 6¼in x 3¼in and uses a 3in speaker. On the right is the first transistorised table receiver, model 365; it runs from a low-voltage dry battery

Examples of "slim-line" television receivers. Above: Philco "Slender Seventeen" model 1000. Right: 17in McMichael console, in which the depth of the body is less than 11in

is beginning to stabilise itself. Improvements are being made continually, but they are detail developments in the painstaking work that goes on all the time to improve the performance of receivers and reduce their cost.

The most noteworthy development recently has been the wider adoption of measures to assist the service engineer when the receiver has to be repaired, enabling the work to be carried out more rapidly and more economically, to the undoubted advantage of all concerned, especially the owner.

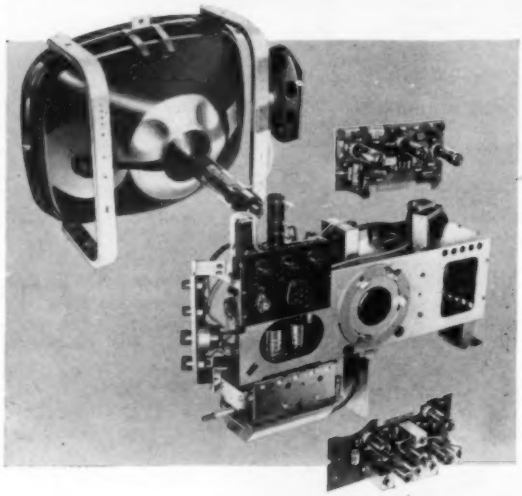
Most receivers now use printed circuit panels, and in some models these panels are mounted on a hinged frame which swings out, giving access to both sides of the panels in a matter of moments, in some cases even while the chassis is still in its cabinet. Several manufacturers simplify the replacement of the line output transformer until the time taken for the operation is so short that a substitute can be tried almost as quickly as trying a new valve. They may simply plug in, or be connected by a number of plugs, and no soldering is necessary.

One receiver is composed of four units: one containing the cathode ray tube and main framework, another consisting of the chassis pressing, while the third and fourth are printed circuit panels which plug in to multiple sockets on the chassis. One of these carries the complete i.f. receiver circuit, and the other the two time-base oscillators, and either can be replaced in a couple of minutes if a fault develops simply by plugging in a new panel.

These are technical developments of a mechanical nature which do not affect the performance of the receiver, but they are of considerable importance when faults occur, because they help the service engineer to get the set back to its owner quickly, and they also save his temper. At the same time they reduce the risk of damage to the receiver during service work and reduce the cost of a repair.

Technical developments in circuitry are to be found in receivers at the show, but they have to be sought out, and often their importance can be fully appreciated only by reference to a circuit diagram. There is a continuing trend towards the inclusion of v.h.f. radio (f.m.) in television receivers, most firms showing some models with this facility, to which the television receiver lends itself very well.

Normally the additional cost of v.h.f. radio is only about five guineas, but there are cases where the selectivity is inadequate, and two manufacturers have adopted quite



In this Alba T655 chassis (left) the two printed circuit panels simply plug in, and are thus easily replaceable, as also is the line output transformer

In this Murphy model A492R the tambour cover is just open sufficiently to give access to the controls. It slides right back

Left: E.M.I. "Capitol" RS101, with twin full range speakers

Ekco BPT333 transistor-operated suit case radio receiver

Right: This "Dansette" shows one arrangement of portable stereophonic record reproducers. The speakers can be attached to the case of the main unit or placed elsewhere in a room

Left: This Decca (SRG300) A.M./F.M. radiogramophone uses a single bass speaker system in the mains unit, which can stand anywhere in the room, and two small plaque satellite speakers for the middle and high notes to give a stereophonic effect

In these two stereophonic radiograms the twin speakers are housed within the cabinet. Right: Regentone model Nine –3; left: Ferguson 602RG "Fergusonic"

elaborate measures to avoid this possible drawback. One of them uses a double superhet circuit, changing the sound intermediate frequency twice, while the other employs an entirely separate v.h.f. radio tuner, with "preferred" intermediate frequency, and then changes his TV sound i.f. channel by switching to work with it. This ensures adequate selectivity, but it increases the cost of the receiver.

Important technical advances being made by the manufacturers of cathode ray tubes are having a marked effect on the performance and design of television receivers. The general use of 90 deg beam deflection has permitted the overall length of the tube to be reduced, and as its length determines the size of the cabinet this has assisted cabinet designers in their achievement of the "slim line" styles in cabinets that some makers are showing.

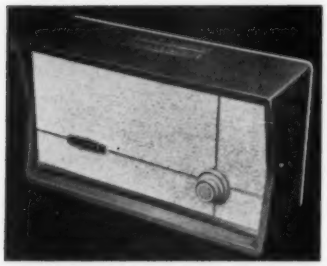
This is most marked in the ingenious design of one cabinet in which the tube screen is allowed to extend into a "picture frame" beyond the apparent confines of the front of the cabinet, while its neck extends into a "blister" at the rear, so that the bulk of the cabinet is reduced without making the whole look small. Its proportions are very pleasing, but the depth of the central "box" area in the 17in model is less than 11in.

Ninety-degree deflection is what is usually termed "wide angle," but it is only a short time since wide angle deflection meant 70 deg. Tube manufacturers are constantly striving to reduce the length of their tubes, however, and it looks as though in the near future the angle of deflection will be increased to 110 deg, which is already current in America. This carries with it serious scanning problems, however, and it may be some time before such tubes are actually fitted in receivers.

Electrostatic Focusing

Most television receivers now are fitted with electrostatic focusing, which is a function of the cathode ray tube. This dispenses with focus magnets, which are now almost a thing of the past, and needs practically no adjustment. At the same time, focus quality is maintained over the whole of the picture area, right into the corners, and the improvement is very noticeable.

The 17in tube seems to have established itself pretty firmly as the optimum size for domestic viewing, the trend towards 21in tubes having abated somewhat, although there are two 24in models at the show. There are 145 receivers with 17in tubes, against 126 last year, and 62 21in, against 83. The changing economic situation may be reflected here, as it is also in an increase in the number of 14in models to 26, against 20 last year. These (comparatively) small screens give an excellent picture at a very low cost.



The satellite speaker may contain an amplifier for the second channel, as does this Baird speaker, which may be used to convert a "mono" reproducer to stereo

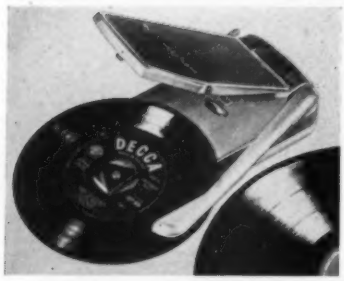
"Ekco" T.P.308, with a 14in tube and F.M. radio receiver

Portable television receivers have become very popular, and there are 18 models to choose from, which is nearly twice as many as there were last year. Four of them are fitted with 17in tubes. They work well in the primary service area from a telescopic aerial fitted to them.

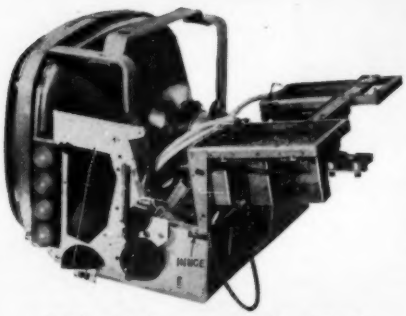
"Consolette" is a term of increasing importance to-day. It describes the type of model which is virtually a table model on removable legs, and as a result the dividing line that distinguishes the table model from the console is ill-defined. Housewives dislike the table model principally because it monopolises a table, but often the extra £10 or so required for a console cabinet is more than she can afford. Optional legs provide her with a floor-standing "consolette" for an extra two guineas.

Little noticeable change can be detected in radio receiver design, apart from a constant trend towards v.h.f. radio (f.m.) and the use of more elaborate speaker systems. Several makers offer f.m.-only receivers now, and there are two kit sets for the home constructor. The biggest radio development is in the transistor field, where although models have been shown previously, they have not been readily available or eagerly sought after. Most firms make them now, however, and they are priced from 13 guineas for one that will slip into the pocket. Transistorised car radio, which is certain to displace the existing vibrator type, is making gradual headway, and three models are shown.

Tape recorders continue to increase in popularity, and there is a very wide range to choose from. Their prices vary considerably, but there is one model which can be obtained for 26 guineas.

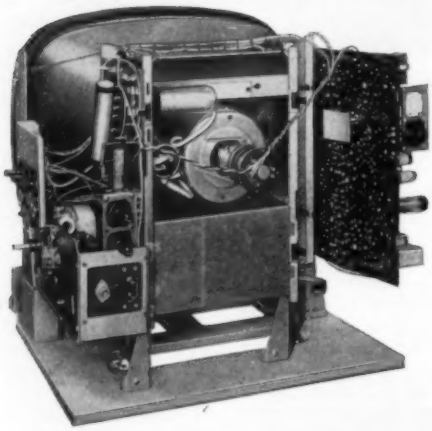


The Ambassador "Wondergram" transistorised record player takes 7in, 10in and 12in LP records. It weighs 2 lb, has a 3in speaker, and when closed can be slipped into the pocket



Sobell television chassis, with its printed circuit panels swung out on hinges to give easy access

The first directly push-button tuned television set is introduced by Bush, in which push-buttons are used to select the channels; no manual trimmer is necessary



Left: Another method of giving convenient access to a circuit panel is seen in this rear view of an H.M.V. chassis

Right: This Pam "Langham" luxury receiver has a 21in television screen and a self-contained A.M./F.M. stereophonic radiogram

Palais des Nations, Geneva

"ATOMS FOR PEACE"

Geneva Atomic Energy Conference and Exhibition

OVER 5,000 scientists from 81 countries are taking part in the second United Nations conference on the peaceful uses of atomic energy, "Atoms for Peace," which opens at Geneva next Monday and continues until 14th September. The official delegation from the United Kingdom will be led by Sir John Cockcroft, member for scientific research of the United Kingdom Atomic Energy Authority, and will include Sir Leonard Owen, managing director of the U.K.A.E.A. Industrial Group, Sir Willis Jackson, representing British industry, Sir George Thomson, nominated by the Royal Society, and Dr. J. F. Loutit, of the Medical Research Council. There will also be about 250 advisers, including the authors of the papers, and about 300 observers.

The president of the conference will be Professor F. Perrin of the Commissariat à l'Energie Atomique de France, and the secretary-general, Dr. S. Eklund of Sweden. Arrangements for British participation have been organised by an executive committee (chairman, Sir John Cockcroft; secretary, Mr. B. W. Mott) and a papers committee (chairman, Dr. B. F. J. Schonland; secretary, Dr. T. A. Hall) with a secretariat operating from the Atomic Energy Research Establishment, Harwell. The membership of the committees has been drawn from the Atomic Energy Authority, the Electricity Boards, the Medical Research Council, universities and other organisations.

More than 2,300 papers on all aspects of atomic development and use are to be presented at the conference and some 200 of these have been submitted by United Kingdom authors; of the latter 87 will be read and the remainder will be included in the official report of the proceedings to be published later this year by Pergamon Press, Ltd. In fact, only a little more than 25 per cent of the total number of papers submitted will actually be read at the conference.

Among the British papers there will be a survey of work in the field of thermo-nuclear research in the United Kingdom by Dr. P. C. Thonemann, of Harwell, as well as a separate paper on the design and performance of "Zeta" prepared jointly by Dr. Thonemann, three of his colleagues at Harwell, and two representatives of the Metropolitan-Vickers Electrical Co., Ltd. There will also be a paper on the theoretical problems associated with "Zeta," a review of the A.E.I. research work on "Sceptre," studies of high-current gas discharges at high rates of build-up, a study of hydromagnetic observations in a plasma and a short theoretical study of the stability of a constricted gas discharge. The other papers cover a wide field of work in many nuclear subjects, including studies of various types of reactor, reviews of experiences at Calder Hall, the designs which have been evolved from the Calder Hall model, the economics of nuclear power, specialised applications of radioactive isotopes, safety aspects, etc.

Papers from the United Kingdom

Among the papers to be presented by British authors are the following:—

"HYDROMAGNETIC DISTURBANCES OF LARGE AMPLITUDE IN A PLASMA," by J. H. Adlam and J. E. Allen (A.E.R.E., Harwell).

"THEORETICAL PROBLEMS ASSOCIATED WITH ZETA," by W. B. Thompson, J. Hubbard, W. Marshall, S. J. Roberts, R. J. Tayler (A.E.R.E., Harwell) and S. F. Edwards (University of Birmingham).

"A REVIEW OF THE CONTROLLED THERMONUCLEAR RESEARCH AT THE A.E.I. RESEARCH LABORATORY," by T. E. Allibone, D. R.

Chick, A. A. Ware (A.E.I. Research Laboratory, Aldermaston) and Sir George Thomson (University of Cambridge).

"FISSION PROCESSES IN THE PROTON BOMBARDMENT OF ^{232}Th, ^{238}U AND ^{239}Pu," by J. P. Butler (A.E.R.E., Harwell), B. J. Bowles and F. Brown.

"MEASUREMENTS OF REACTOR SPECTRA BY TIME-OF-FLIGHT AND INTEGRAL METHODS," by C. G. Campbell (A.E.R.E., Harwell), M. S. Coates, R. G. Freemantle and M. J. Poole.

"THE USE OF THE PILE OSCILLATOR IN THERMAL REACTOR PROBLEMS," by H. Rose (A.E.R.E., Harwell), W. A. Cooper and R. B. Tattersall.

"GENERAL REVIEW OF GRAPHITE MODERATED THERMAL REACTOR CALCULATIONS," by C. G. Campbell, P. W. Mummery (A.E.R.E., Harwell), B. Cutts and I. A. Mossop (U.K.A.E.A. Industrial Group).

"THE CALCULATION OF THERMAL NEUTRON SPECTRA," by A. Hassitt (A.E.R.E., Harwell), P. Schofield and J. H. Tait.

"RESEARCH REACTOR UTILISATION," by F. W. Fenning, R. F. Jackson (A.E.R.E., Harwell) and K. Q. Bagley (U.K.A.E.A. Industrial Group).

"PROCESSING OF REACTOR FUELS BY LIQUID METALS," by I. L. Jenkins (A.E.R.E., Harwell), N. J. Keen and F. S. Martin.

"THE STABILITY OF A CONSTRICTED GAS DISCHARGE," by R. J. Tayler (A.E.R.E., Harwell).

"EXPERIMENTAL WORK WITH ZERO ENERGY FAST REACTORS," by R. D. Smith (A.E.R.E., Harwell) and J. E. Sanders.

"CRITICAL AND SUBCRITICAL ASSEMBLY EXPERIMENTS WITH A TWO-GROUP CORRELATION OF RESULTS," by C. G. Campbell and I. S. Grant.

"THE ALPHA-RAY ACTIVITY OF HUMANS AND THEIR ENVIRONMENT," by W. V. Maynoord (Institute of Cancer Research), J. M. Radley and R. C. Turner.

"SOME CHEMICAL PROBLEMS OF HOMOGENEOUS AQUEOUS REACTORS," by J. K. Dawson (A.E.R.E., Harwell), B. Cox, R. Murdoch and R. G. Sowden.

"THE POLYZONAL SPIRAL FUEL ELEMENT," by H. L. Ritz (Nuclear Power Plant Co., Ltd., Knutsford).

"FUEL ELEMENT BEHAVIOUR UNDER IRRADIATION," by V. W. Eldred (U.K.A.E.A. Industrial Group), G. B. Greenough and P. Leech.

"THE ECONOMICS OF ENRICHMENT AND OF THE USE OF PLUTONIUM AND URANIUM 233," by N. J. Franklin, J. M. Hill, J. C. C. Stewart (U.K.A.E.A. Industrial Group) and C. A. Rennie (A.E.R.E., Harwell).

"EXPERIENCE IN THE DESIGN OF IRRADIATION LOOPS," by H. Cartwright, B. E. Elsham (U.K.A.E.A. Industrial Group) and R. F. Jackson (A.E.R.E., Harwell).

"THE DESIGN AND OPERATION OF A HIGH INTENSITY PULSED NEUTRON SOURCE USING A BOOSTER TARGET," by G. D. James (A.E.R.E., Harwell), M. J. Poole, R. J. Royston, J. H. Tait, C. A. Uttley and E. R. Wiblin.

"ECONOMICS OF NUCLEAR POWER," by J. A. Jukes (U.K.A.E.A., London Office).

"CURRENT RE-DESIGNS OF CALDER HALL," by J. B. W. Cunningham (U.K.A.E.A. Industrial Group).

"THE POSSIBILITY OF THE DIRECT APPLICATION OF FISSION FRAGMENT ENERGY TO CHEMICAL PROCESSES," by J. K. Dawson (A.E.R.E., Harwell), G. Long, F. Moseley and R. G. Sowden.

"CONTROLLED THERMONUCLEAR RESEARCH IN THE UNITED KINGDOM," by P. C. Thonemann (A.E.R.E., Harwell).

"CHEMICAL PROCESSES AT U.K. ATOMIC ENERGY AUTHORITY WORKS, DOUNREAY," by G. R. Howells (U.K.A.E.A. Industrial Group), J. S. Broadley, C. Buck, K. Hartley, T. A. Parry, B. F. Warner and J. A. Williams.

"CRITICAL ASSEMBLY EXPERIMENTS AT DOUNREAY," by G. W. K. Ford (U.K.A.E.A. Industrial Group), B. J. Owen and J. G. Walford.

"THE APPLICATION OF RADIO-TRACERS TO THE MEASUREMENT OF ENGINE WEAR IN MOVING VEHICLES," by J. H. Deterding ("Shell" Research, Ltd., Chester) and J. R. B. Calow.

"OCCUPATIONAL HAZARDS FROM EXPOSURE TO IONISING RADIATIONS: A STUDY OF THE CAUSES OF DEATH AND THE MORTALITY RATE AMONG BRITISH RADIOLOGISTS," by W. M. Court Brown (Medical Research Council, Edinburgh) and Richard Doll.

"THE PRODUCTION OF BORON 10 AND OTHER STABLE ISOTOPES," by A. O. Edmunds (20th Century Electronics, Ltd., Croydon) and F. C. Loveless.

"THE U.K. PROGRAMME FOR THE DEVELOPMENT OF NUCLEAR POWER," by W. Strath (U.K.A.E.A.).

"SAFETY ASPECTS OF THE CALDER HALL TYPE REACTOR IN THEORY AND EXPERIMENT," by G. Brown, H. Kronberger, F. M. Leslie, J. Moore (U.K.A.E.A. Industrial Group) and P. W. Mummery (A.E.R.E., Harwell).

"CONTRIBUTIONS TO KNOWLEDGE OF ELEMENTARY PARTICLES BY EXPERIMENTS WITH COSMIC RADIATION," by C. F. Powell (University of Bristol).

"LIQUID METAL FUEL TECHNOLOGY," by B. R. T. Frost (A.E.R.E., Harwell).

"STEAM CYCLES FOR GAS-COOLED REACTORS," by W. R. Wootton (Babcock & Wilcox, Ltd., London), A. J. Taylor and N. G. Worley.

"THE DOUNREAY FAST REACTOR—BASIC PROBLEMS IN DESIGN," by H. Cartwright (U.K.A.E.A. Industrial Group) and J. Tatlock.

"RADIOLOGICAL PROTECTION AT THE SPRINGFIELDS WORKS OF THE U.K. ATOMIC ENERGY AUTHORITY," by A. Butterworth (U.K.A.E.A. Industrial Group), A. Cook and H. Mason.

"RECENT DEVELOPMENTS IN INSTRUMENTATION FOR THE SURVEY, ASSAY AND MINING OF RADIOACTIVE RAW MATERIALS," by H. Bisby (A.E.R.E., Harwell) and D. Williams.

"EXPERIENCE IN THE U.K. ATOMIC ENERGY INDUSTRY, 1947–58," by Sir Leonard Owen (U.K.A.E.A. Industrial Group).

"CONTROL OF RADIATION EXPOSURE IN THE U.K. ATOMIC INDUSTRY," by H. J. Dunster, F. R. Farmer, A. S. McLean (U.K.A.E.A. Industrial Group) and W. G. Marley (A.E.R.E., Harwell).

"CHEMICAL STUDIES OF CARBON DIOXIDE AND GRAPHITE UNDER REACTOR CONDITIONS," by A. R. Anderson (A.E.R.E., Harwell), H. W. Davidson (G.E.C. Research Laboratories, Wembley), R. Lind, C. Tyzack (U.K.A.E.A. Industrial Group) and D. R. Stranks (University of Leeds).

"THE CHEMISTRY AND METALLURGY OF NEPTUNIUM, by H. A. C. McKay, M. B. Waldron (A.E.R.E., Harwell) and J. S. Nairn (U.K.A.E.A. Industrial Group).

"ADVANCES IN THE DESIGN OF GAS-COOLED POWER REACTORS," by R. V. Moore (U.K.A.E.A. Industrial Group), L. Grainger and H. Kronberger.

"THE POSSIBILITIES OF ACHIEVING HIGH TEMPERATURES IN A GAS-COOLED REACTOR," by L. R. Shepherd (A.E.R.E., Harwell).

"DISTRICT SURVEYS FOLLOWING THE WINDSCALE INCIDENT," by A. S. McLean (U.K.A.E.A. Industrial Group), H. J. Dunster, H. Howells and W. L. Templeton.

"FABRICATION TECHNOLOGY OF BERYLLIA AND BERYLLIUM," by D. T. Livey (A.E.R.E., Harwell) and J. Williams.

"ECONOMIC ASPECTS OF THE U.K. NUCLEAR POWER PROGRAMME," by J. C. Duckworth (Central Electricity Generating Board, London) and E. H. Jones.

"DEVELOPMENTS IN THE ANALYTICAL SERVICE GIVEN TO INDUSTRIAL ATOMIC ENERGY," by F. Woodman (U.K.A.E.A. Industrial Group), T. G. Clinton, W. Fletcher and G. A. Welch.

"THE EXTRACTION OF ACTINIDE ELEMENTS FROM WASTES," by J. S. Nairn, D. A. Collins (U.K.A.E.A. Industrial Group), H. A. C. McKay (A.E.R.E., Harwell) and A. G. Maddock (University of Cambridge).

"THE DESIGN, CONSTRUCTION AND EQUIPMENT OF SOME HIGH ACTIVITY CELLS IN THE U.K.," by J. E. Bown (A.E.R.E., Harwell) and E. D. Hyam (U.K.A.E.A. Industrial Group).

"STUDIES OF HIGH CURRENT GAS DISCHARGES AT HIGH RATES OF BUILD-UP," by S. C. Curran (A.W.R.E., Aldermaston), K. W. Allen, H. A. B. Bodin, R. A. Fitch, N. J. Peacock and J. A. Reynolds.

"STABILITY CONSIDERATIONS IN THE DESIGN OF FAST REACTORS," by R. T. Ackroyd, J. E. Mann, J. D. McCullen (U.K.A.E.A. Industrial Group) and G. H. Kinchin (A.E.R.E., Harwell).

"BODY RADIOACTIVITY MEASUREMENT AS AN AID IN ASSESSING CONTAMINATION BY RADIO-NUCLIDES," by J. Rundo (A.E.R.E., Harwell).

"THE DESIGN AND PERFORMANCE OF ZETA," by P. C. Thonemann, R. Carruthers, J. T. D. Mitchell, R. S. Pease (A.E.R.E. Harwell), J. Blears and E. R. Hartill (Metropolitan-Vickers Electrical Co., Ltd., Manchester).

"DIAGNOSTIC TECHNIQUES IN CONTROLLED THERMONUCLEAR RESEARCH," by G. N. Harding (A.E.R.E., Harwell), A. N. Dellis, A. Gibson, B. Jones, D. J. Lees, R. W. P. McWhirter, S. A. Ramsden and S. Ward.

"HIGH ENERGY MACHINE PHYSICS IN BRITAIN," by H. W. B. Skinner (University of Liverpool).

"OPERATING EXPERIENCE AT CALDER HALL," by H. G. Davey (U.K.A.E.A. Industrial Group), J. Gawthrop and T. N. Marsham.

"THE SAFETY OF THE DESIGN AND USE OF THE DIDO CLASS OF RESEARCH REACTORS," by R. F. Jackson (A.E.R.E., Harwell), F. W. Fenning and B. S. Smith.

"THE RELEASE OF WIGNER ENERGY IN THE HARWELL REACTOR, BEPO," by R. F. Jackson (A.E.R.E., Harwell).

"SAFETY AND SITING CONSIDERATIONS FOR GAS-COOLED THERMAL REACTORS OF THE CALDER HALL TYPE," by F. R. Farmer, P. T. Fletcher (U.K.A.E.A. Industrial Group) and T. M. Fry (A.E.R.E., Harwell).

MOTIONS FOR T.U.C.

The 68 motions on the agenda for the ninetieth Trades Union Congress, which meets at Bournemouth from 1st to 5th September range from trade union organisation and practice to the origin of television material.

There is little preoccupation this year with nationalisation. The Association of Supervisory Staffs, Executives and Technicians expresses "concern at the nature of many of the appointments to the Boards of nationalised industries." It wants "only those with a belief in the necessity and value of nationalised industries" to be appointed to the Boards. The Electrical Trades Union "declares the urgent necessity for the nationalisation of Britain's basic industries, with priority for the key sections of the engineering industry, and the re-nationalisation of the iron and steel industry and that part of the road transport industry returned to private industry."

The question of Government interference in negotiating machinery is raised in a motion of the National Union of General and Municipal Workers. It asserts that the confidence of employees in the nationalised industries and public services "is often undermined by the Government and public authorities in bringing to bear undue influence on the negotiating machinery responsible for agreeing wages and conditions of service." It "calls upon the General Council to raise with the Government the whole question of the functioning of collective bargaining machinery in these services, and in particular the effect of Ministerial influence on questions dealing with the terms and conditions of employment and the extent to which these industries have freedom to fix their own price structure to enable them to pay wages and salaries comparable with other industries."

Under the heading, "Production and Industrial Development," the General Council's report refers to fuel and power co-ordination. The Minister of Fuel and Power had agreed to a request to submit a statement to the National Production Advisory Council for Industry on the nation's fuel and power position. The request had arisen out of discussions on the rate of technical advance in nuclear power generation and the Government's investment programme for the fuel and power industries. "It did not appear to the General Council that the Government had a comprehensive fuel and power policy, the need for which . . . had been apparent for a number of years."

The statement by the Minister disappointed the General Council whose report says that it merely outlined the broad picture of fuel supplies and demand up to 1965, and much of the information had been previously available. There was no reference in the statement to co-ordination in the production and use of fuel. There is a need, the General Council re-emphasises, for a national fuel and power policy. It draws attention to the importance of further research, "to find means of using small coal and of using oil as a substitute for large coal rather than replacing plant capable of using small coal by oil-burning plant installation."

Arising out of the resolution carried by the 1957 Congress, which called for more detailed co-ordination of the coal, gas and electricity industries, improved efficiency in the use of fuel, and greater research into the use of coal as a source of chemicals, representatives of the General Council met the Minister of Fuel and Power at their request. They urged the need for a more clearly co-ordinated fuel and power policy. The Minister agreed with the importance of co-ordination, and drew attention as to how far it was already in force through informal consultation and Ministry committees. The General Council representatives were not impressed. They "argued that this was inadequate to such an important matter of public policy, and that an annual report should be made available on this aspect of the Minister's responsibilities."

DOMESTIC APPLIANCES IN AMERICA

AMERICAN enthusiasm for new ideas, the tremendous competitive market, the vast range of domestic electrical appliances and the great variations in the prices charged for the same appliances in different shops are some of the leading impressions brought back by Miss Mary George, director of the Electrical Association for Women, from her recent visit to the United States. With Mrs. M. E. Pickford (Head of the E.A.W. Housecraft Department), Miss Margaret Leader (General Electric Co.) and Miss Joyce Logan (East Midlands Electricity Board) she had been among the 1,000 delegates from 59 countries attending the Ninth International Congress on Home Economics at the University of Maryland. Last week at an informal tea party at the Association's headquarters at Foubert's Place, London, S.W.1, Miss George, Mrs. Pickford and Miss Leader spoke with infectious enthusiasm of their experiences at the congress, on the official tours and in studying the electrical way of life in the United States.

Although appliances could be obtained in discount houses at up to 30 per cent less than in large stores, Miss George pointed out that no display or service facilities were provided and no responsibility was taken for defects. She had seen no appliances that were new in principle, but there was much interest in electronic ovens, ultrasonic washing, and heat pumps for heating and refrigeration. The most popular size of refrigerator was about 13 cu ft and with built-in kitchens there was a tendency towards separating the different parts of the cooker and even having two ovens, one containing a spit. As much interest was taken in lighting as in decoration, and a growing use was made of switches giving different levels of lighting. The development of air conditioning had caused a summer peak which the utilities were trying to offset by the promotion of space heating in winter. The co-operative campaign supported by all branches of the industry to improve house wiring had met with much success.

Institute of Metals Jubilee

THE Institute of Metals is holding a golden jubilee autumn meeting in Birmingham from 22nd to 26th September, with headquarters at the Birmingham College of Technology. In addition to lectures, discussions and papers including one on fifty years' progress in non-ferrous metals technology on 23rd September, and others on 24th September under the general theme "extrusion," a number of works visits are being arranged. Full particulars can be obtained from the secretary of the Institute, 17, Belgrave Square, S.W.1.

OVERSEAS ELECTRICAL TRADE

July Exports Above the Monthly Average for 1958

THERE was a marked recovery in British electrical exports in July and good progress was made in overtaking the delay in the movement of goods caused by the dock strike. The total for the month of £20,654,584 was £5·5 million greater than for June and £2 million above the monthly average for the first half of the year. So far this year—to the end of July—£131,920,759 worth of electrical equipment has been exported, compared with £137,078,203 in the first seven months of last year and £128,004,275 in the corresponding period of 1956.

The recovery in exports which was reflected in nearly all the main categories of electrical goods, was particularly marked in heavy machinery and electronic equipment, and the total exports for the seven months of 1958 of generating sets, motors, etc., converting machinery and telegraph and telephone apparatus, were higher than in the same periods of 1957 and 1956. The July figure for generating sets, motors, etc., of £3,714,404 was an increase of £1·2

TABLE I.—ELECTRICAL EXPORTS

Class	Month of July, 1958	Seven months ended 31st July, 1957	Seven months ended 31st July, 1958
	£	£	£
Generating sets and generators:			
Diesel-driven, up to 10 kW	93,974	1,051,518	849,575
Ditto, 10 to 65 kW	301,194	1,165,281	1,426,233
Ditto, 65 to 200 kW	232,561	883,438	1,357,585
Ditto, over 200 kW	612,646	2,223,036	2,944,867
Spark ignition engine driven	22,018	123,025	136,437
Steam turbine driven	105,772	289,514	539,165
Hydraulic turbine driven	17,542	—	17,542
Other prime mover driven	57,661	189,878	135,706
Generators, not exceeding 200 kW	139,783	1,119,687	914,981
Ditto, over 200 kW	172,561	951,862	760,079
Parts of generators	646,179	2,588,226	4,929,528
Motors, complete, other than railway, tramway and trolley-bus:			
Up to ½ h.p.	160,265	1,420,374	1,091,084
Over ½ but under 1 h.p.	43,808	331,024	362,964
1 h.p. to 250 h.p.	464,900	3,426,338	3,337,736
Over 250 h.p.	173,908	976,867	835,931
Railway, tramway and trolley-bus motors complete and parts of all motors	143,002	1,439,947	1,501,940
Motor starting and controlling gear	326,630	2,250,952	1,882,217
	3,714,404	20,430,967	23,023,570
Converting machinery	20,979	401,564	230,488
Mercury-arc rectifiers	115,839	747,936	728,944
Transformers for lighting, heating and power (incl. coils):			
Not exceeding 7,500 kVA	637,392	4,423,727	4,514,574
Over 7,500 kVA	607,674	1,799,905	3,196,769
Switchgear and switchboards (not telegraph or telephone), up to 200 A and 660 V	409,843	2,400,180	2,837,715
Ditto, other	1,098,597	8,448,271	7,152,675
	2,890,324	18,221,583	18,661,165
Primary batteries:			
Lighting	109,338	689,280	621,369
Radio	324,141	1,787,060	2,072,492
Other	55,979	301,961	317,536
Parts (excl. carbons)	56,285	393,276	339,873
Lamps:			
Filament, exceeding 28 V	85,844	654,766	589,570
Ditto, under 28 V	35,213	214,767	201,077
Arc lamps and searchlights	14,377	99,353	128,159
Discharge lamps, fluorescent tubes, etc.	116,786	659,907	604,039
Radio and television, etc., apparatus:			
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury arc rectifiers), photo-electric cells, stabilising and cold cathode valves, magnetrons, klystrons	31,656	168,430	192,254
All other	420,193	2,123,062	2,429,434
Parts (excluding glass bulbs)	22,263	85,272	121,159
Radio and television transmitters	2,737	466,116	229,179
Commercial radio and radar equipment	1,263,845	9,000,969	8,194,872
Domestic radio receivers, mains	74,540	800,412	564,545
Ditto, battery	48,392	395,723	367,119
Ditto, other (incl. car)	22,448	184,699	154,217
Radiograms	19,815	201,694	215,760
Television sets	64,843	413,302	711,648
Public address equipment	92,937	665,638	679,740
Other radio and television apparatus, n.e.s.	27,711	305,888	215,684
Components and parts, n.e.s.	904,646	5,629,383	5,340,520
	2,996,026	20,440,588	19,416,131
Telegraph and telephone installations	686,922	5,075,259	5,251,373
Telephone instruments, separately consigned	182,722	1,140,565	1,294,190
Telegraph and telephone parts	1,123,598	5,703,777	5,430,511
Line apparatus for long distance communication	236,464	1,274,608	1,244,030
	2,229,706	13,194,209	13,220,104

Class	Month of July, 1958	Seven months ended 31st July, 1957	Seven months ended 31st July, 1958
	£	£	£
Cookers	58,809	461,111	391,764
Toasters	33,972	140,654	152,445
Other cooking apparatus	34,198	221,570	241,792
Parts and accessories	78,844	475,522	399,374
Space heating appliances	21,676	231,374	229,278
Water heating appliances	24,638	227,700	191,519
Other heating appliances	27,217	259,867	240,388
Parts and accessories	78,189	401,810	455,193
Irons	96,367	508,887	539,179
Arc welding equipment, a.c.	50,357	374,514	398,700
Ditto, d.c.	77,414	321,402	554,005
Resistance welding equipment	27,922	172,391	108,864
Electric furnace plant	240,053	616,651	741,544
Magnetos, ignition	17,163	187,223	109,020
Sparking plugs	195,005	1,177,364	1,046,990
Elec. appliances for aeroplanes, n.e.s.	404,274	1,913,184	1,998,054
Ditto, for motor vehicles, n.e.s.	393,474	2,503,744	2,706,042
Ditto, for cycles, n.e.s.	53,576	416,956	374,990
Signalling app. (incl. traffic signals)	121,344	815,840	987,839
Instruments, commercial	171,265	1,239,603	1,245,488
House service meters (including parts)	135,876	999,588	1,015,388
Electro-medical apparatus (not X-ray)	45,801	296,192	341,778
X-ray apparatus (excl. tubes and valves)	45,506	511,197	384,619
Vacuum tubes	32,671	308,658	323,376
Ceiling fans, complete	112,486	854,742	754,446
Desk fans, complete and parts of desk and ceiling fans	51,200	275,136	199,943
Vacuum cleaners	115,757	1,068,023	901,424
Floor polishers	101,752	615,543	487,071
Food mixers	61,732	348,812	383,181
Hair clippers and dry shavers	52,052	559,890	371,421
Other portable appliances	17,754	198,081	126,431
Parts	118,917	933,910	760,295
Portable elec. tools (not saws) and parts	226,032	1,557,051	1,522,106
Cables and wires:			
Telegraph and telephone, submarine	99,359	4,074,385	524,998
Ditto, other	511,751	6,927,416	3,807,216
Cotton, silk or art. silk insulated	15,874	270,452	291,772
Enamel, glass or asbestos insulated	152,712	680,961	641,006
Paper insulated	497,090	5,694,731	4,930,585
Rubber insulated	385,188	3,940,391	3,266,832
Thermoplastic insulated	186,470	1,372,255	1,355,322
Other	237,936	1,315,753	1,607,471
	2,086,380	24,276,344	16,425,202
Accumulators for motor vehicles	175,799	1,085,351	1,140,159
Ditto, traction	21,307	183,523	151,367
Ditto, radio and other portable	117,126	532,626	439,077
Ditto, other	17,589	225,792	175,522
Parts and accessories	70,654	583,459	706,766
Electric wiring accessories	249,143	355,037	1,194,864
Elec. porcelain, etc. (incl. insulators), n.e.s.	131,037	758,718	744,794
Insulating cloth and tape	59,962	418,649	343,307
Other insulating material	140,791	682,787	705,482
Permanent magnets	62,159	359,256	358,426
Radio, telegraph and telephone testing equipment, n.e.s.	52,188	466,669	431,549
Scientific elec. instruments (not telegraphic or telephonic):			
Time recorders and time switches, complete	45,878	84,139	227,695
Other	352,818	2,084,495	2,474,000
Electrical machinery, n.e.s.	69,586	550,926	512,623
Electrical apparatus and appliances, n.e.s.	1,040,451	6,148,525	6,010,894
TOTAL	20,654,584	137,078,203	131,920,759

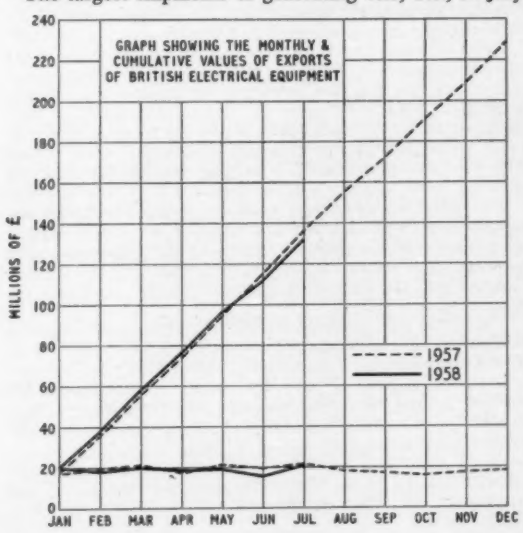
TABLE II.—DISTRIBUTION OF EXPORTS OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	Month of July, 1958	Seven months ended 31st July, 1957	Seven months ended 31st July, 1958	Country	Month of July, 1958	Seven months ended 31st July, 1957	Seven months ended 31st July, 1958
	£	£	£		£	£	£
Channel Islands	159,496	624,299	840,318	Netherlands	619,987	4,940,824	4,211,283
Gibraltar	24,323	129,982	223,521	Belgium	283,241	2,276,565	1,983,889
Malta and Gozo	48,444	407,933	491,670	France	470,585	2,763,152	2,535,043
Cyprus	91,650	951,139	586,623	Switzerland	156,484	894,238	1,070,663
Sierra Leone	88,191	253,551	436,692	Portugal	246,161	1,760,930	2,189,793
Ghana	133,831	1,294,615	1,095,717	Spain	117,655	2,551,506	1,158,646
Nigeria	400,681	1,914,113	2,594,583	Italy	290,133	2,491,724	1,977,126
Union of South Africa	1,966,066	10,255,361	11,741,266	Austria	46,830	268,107	303,268
Rhodesia and Nyasaland	421,515	3,564,487	3,076,297	Yugoslavia	42,192	338,410	334,524
Tanganyika	44,251	502,341	335,502	Greece	85,622	957,149	597,138
Kenya	166,535	1,757,508	965,251	Turkey	19,599	400,047	715,404
Uganda	52,054	659,693	435,602	Belgian Congo	51,873	322,499	263,252
Mauritius	38,904	225,405	288,398	Portuguese East Africa	21,021	212,093	166,041
Aden	60,854	339,016	398,817	Egypt	116,953	16,674	745,346
Bahrain, Qatar and Trucial States	109,474	1,079,289	626,270	Libya	77,478	248,287	403,833
Kuwait	249,243	2,021,355	1,196,656	Southern Morocco	47,352	243,137	233,337
India	1,808,504	14,365,994	11,071,079	Sudan	116,412	770,241	656,979
Pakistan	216,222	1,972,630	1,634,422	Syria	39,777	212,597	175,850
Singapore	349,056	2,465,606	2,179,166	Lebanon	41,147	273,222	365,383
Federation of Malaya	323,996	2,022,345	1,982,952	Israel	88,424	458,584	661,443
Ceylon	174,018	980,334	1,074,674	Jordan	34,977	439,903	487,409
British North Borneo	19,078	175,057	136,839	Saudi Arabia	83,533	369,871	573,045
Sarawak	42,296	172,648	169,164	Iraq	165,108	1,718,779	1,916,686
Hong Kong	251,438	1,740,870	1,982,945	Iran	354,271	2,505,351	2,467,306
Australia	2,091,174	11,805,927	11,428,460	Burma	52,510	618,499	457,236
New Zealand	1,140,942	6,688,912	8,021,141	Thailand	75,791	634,223	929,032
Fiji	77,339	122,183	197,445	Indonesia	19,190	395,363	196,164
Canada	1,158,909	7,830,013	8,677,382	Japan	35,395	552,512	346,421
Jamaica	125,891	698,973	934,380	United States of America	799,785	9,073,456	4,578,184
Barbados	32,764	128,144	183,604	Cuba	40,884	382,353	527,183
Trinidad	165,047	832,603	851,568	Mexico	50,934	375,010	348,677
British Guiana	40,476	281,437	499,044	Colombia	8,506	415,220	253,764
Other Commonwealth countries	170,003	719,727	1,140,147	Venezuela	528,798	1,994,065	2,656,593
Irish Republic	310,191	1,554,760	1,952,695	Peru	65,177	417,154	271,539
Soviet Union	38,991	1,318,408	287,608	Chile	84,753	298,287	307,502
Finland	118,465	981,128	876,153	Brazil	82,715	624,278	697,658
Sweden	415,765	2,717,152	3,200,637	Uruguay	521	142,835	15,790
Norway	231,986	1,481,603	1,482,241	Argentine Republic	662,633	875,577	2,534,035
Denmark	172,984	1,400,244	1,316,790	Other foreign countries	550,188	2,665,702	2,511,977
Poland	90,798	339,613	535,733				
Western Germany	358,144	1,402,381	1,946,785	DIVISIONAL TOTAL	20,654,584	137,078,203	131,920,759

million over that for June but slightly below the value exported in May. The seven months' total was over £2·5 million better than in January-June last year. The converting machinery group showed an increase of about £500,000 to a seven months total of £18,661,165; and telegraph and telephone apparatus was nearly £1 million up on the June figure, bringing the total to the end of July to £13,220,104.

Although the July figure for radio and associated equipment was about £800,000 greater than in June the total for the year so far is still about £1 million less than for the corresponding period of 1957. A drop in exports of cables and wires of £456,000 brought the total to £16,425,202 or £7·8 million below the 1957 figure.

The largest shipments of generating sets, etc., in July were to South Africa, India and Canada each of which took plant valued at over £300,000. South Africa also took converting machinery worth £661,251, and other large purchasers were India (£371,795) and the United States (£320,241). Total deliveries of converting machinery to the United States during the first seven months of 1958 at £1,221,846 were three times the figure for the same period last year. Telegraph and telephone equipment worth £491,669 was sent to Australia in July and £310,739 to New Zealand.



In addition to the classes of equipment given in Table I and whose distribution is analysed in Table II, other types of electrical goods shown in the returns include: Electric locomotives: July, £408,889; seven months (January-July), £1,943,622 (against £2,610,193). Locomotives with i.c. engines and electrical transmission: July, £296,461; seven months, £1,262,023 (£859,409). Electrically-operated washing machines: complete not exceeding 150 lb net weight: July, £258,961; seven months, £2,654,055 (£1,992,086). Ditto, 150-250 lb: July, £79,534; seven months, £565,438 (£729,053). Parts, July, £88,108; seven months, £519,403 (£427,277). Welding electrodes: July, £122,040; seven months, £842,712 (£873,522). Electric conduit tubes and cased tubes: July, £51,315; seven months, £382,630 (£559,263). Electric carbons, including parts: July, £65,743; seven months, £376,394 (£402,898). Electric lighting fittings and lanterns (excluding arc lamps, searchlights, and lamps for road vehicles): July, £323,171; seven months, £2,005,044 (£1,450,185). Other electric lighting appliances (excluding vacuum tubes and lamp bulbs) and fittings and parts: July, £26,128; seven months, £387,256 (£1,683,638).

Electrical imports in July amounted to £2,711,799, as compared with £2,310,423 in June, and £2,355,986 in July, 1957. The total for the first seven months of this year was £16,720,527 (against £15,080,172 for January-July, 1957). The largest supplier in July was the United States (£814,461), followed by West Germany (£501,248) and the Netherlands (£349,340).

Qualifications and Salaries

Extra Payments Discussed by the E.P.E.A.

THE *Electrical Power Engineer* reports a recent meeting of the National Executive Council of the Electrical Power Engineers' Association at which extra payments to engineers with specified academic qualifications was discussed.

The general secretary (Mr. H. Norton) referred to the decision of the Electricity Council to introduce a scheme of higher rates of pay for new entrants to the electricity supply industry with first or second class honours university degrees, graduate membership of the Institution of Electrical or Mechanical Engineers, or comparable qualifications; the amount of extra pay would vary according to the type of qualification. The Association's National Investigation Committee had approved the Electricity Council's action in principle.

Informal discussion had also taken place about the possibility of "plus payments" for staff holding academic qualifications being applied in the National Joint Board salary schedules but disappearing in the higher salary ranges. Mr. Norton thought that some would say that the traditional viewpoint of the Association was that all men should receive the same salary for the same position. Against this had to be balanced the desire of the Association throughout its history that its members should have a recognised professional status backed by a minimum standard of qualification.

Two or three members of the National Executive Council opposed salary differentials, holding that the possession of qualifications would, other things being equal, bring its own reward in the way of faster advancement. Other speakers were in favour of special payments in respect of academic qualifications as a means of raising the general standard of electricity supply engineers.

In the result a motion for the rejection of the proposal for special qualification payments was carried.

Good Year in Tasmania

ADDITIONS to water storage enabled the Hydro-Electric Commission of Tasmania to improve on its budgeted income by 3 per cent in the year ended 30th June, 1957. Another favourable factor was an easing in the upward trend of construction costs. Prices of electrical equipment, purchased almost entirely from overseas, showed no appreciable increase from 1956 to 1957, states the Commissioner, Mr. A. W. Knight, M.E., B.Sc., B.Com., M.I.E.(Aust.), in his report.

During the year three generating sets at Wayatinah "B" power station and one at Lake Echo became available for operation, raising the system installed capacity from 446,490 to 485,350 kW. The output for the year was 2,143 million kWh. The Wayatinah "A" and Catagunya schemes now under construction will increase the average annual output capacity to 3,000 million kWh by the end of 1962, but by that time it is anticipated that 3,080 million kWh will be required. The investigation and development of further schemes must therefore be pressed forward. On the question of alternative fuel sources (coal and nuclear power), the report says that the position in other parts of the world is being watched but production costs by these means are still well in excess of those of water power.

The system peak load reached 364,850 kW in 1956-57, compared with 338,200 kW in the previous year. Electricity sales aggregated 1,884 million kWh, 21·6 per cent more than in 1955-56. Of this total 1,253 million kWh was supplied in bulk, the Electrolytic Zinc Co. of Australasia, Ltd., and the Australian Aluminium Production Commission in particular greatly increasing their consumption. Retail consumers took 631 million kWh, equal to an average per consumer of 5,820 kWh. Electric ranges in use throughout the State now total 64,158 and hot-water services 54,340, these figures representing 72 and 61 per cent, respectively, of the number of domestic consumers.

The Commission's accounts show that income from retail sales rose by £647,842 to £4,381,914, partly owing to a 10 per cent tariff increase in August, 1956. Total revenue, including bulk supplies, amounted to £5,948,077 and there was a net profit of £346,403 compared with the £137,951 surplus in 1955-56 and a loss of £212,047 in 1954-55. Changes in financial procedure, including extension of the life of assets for depreciation purposes, were responsible for £281,167 of the past year's net profit.

Capital expenditure for the year amounted to £7,222,717, against £8,212,155 in 1955-56.

Fuel Efficiency Meetings

A SERIES of technical meetings arranged by a committee convened by the Institute of Fuel will be held in the Conference Hall at Olympia on the mornings of 25th, 26th and 30th September and 1st October during the Industrial Fuel Efficiency Exhibition. The general theme will be "Lower Costs and Higher Production through better Fuel Utilisation." The implications of the Clean Air Act and the importance of the economic background will be kept well in mind throughout the programme. The full text of all papers will be available in advance. Applications for tickets of admission (stating sessions required), advance copies of papers (enclosing 2s in stamps), and further details can be obtained from the secretary, the Institute of Fuel, 18, Devonshire Street, London, W.1.

Isle of Wight Television

TO-MORROW, Saturday, the new television transmitter station of the Independent Television Authority at Chillerton Down, Isle of Wight, will be put into operation to serve the 2¾ million people living within the area bounded by Weymouth in the West, Newbury in the North and Brighton in the East. This is the seventh I.T.A. transmitter to come into service, and the fifth for which Marconi's Wireless Telegraph Co., Ltd., have supplied and installed the complete transmitting equipment including the aerial systems.

The Chillerton Down transmitting station embodies many interesting technical features. For instance, the vision transmitters are the first of a new type and represent a big step forward in television transmitter design technique. A considerable reduction has been made in the number of valves used, which has permitted a clean, straightforward layout and the incorporation of a simple yet effective cooling system.

The aerial is a twin-eight stack array (used in the present instance as a sixteen-stack) mounted on a 750ft triangular mast. The radiation pattern is directional in character with a minimum of back-radiation southwards across the English Channel and the maximum extending in an arc across the south coast of England.

The aerial gain is about 16 dB in the forward direction over an arc of 180 degrees. It is the intention of the I.T.A. to use one pair of vision and sound transmitters as "main" with the other pair as "standby" so that the aerial, fed by a vision output of 4 kW (and allowing for feeder losses), provides a vision effective radiated power of about 100 kW over this arc.

For Southern Television, Ltd., the programme contractors for the area, Marconi's have supplied the sound equipment and the master control switching at their Studio Centre.

BRITISH ASSOCIATION PRESIDENTIAL ADDRESS

AT the opening meeting in Glasgow of the British Association for the Advancement of Science (27th August to 3rd September) the presidential address was delivered by Sir Alexander Fleck, F.R.S. (deputy chairman, Imperial Chemical Industries), who took as his theme "Science and Business: A Balanced Partnership." Science he defined as "an approach to an understanding of the universe along a broad highway of organised knowledge firmly founded on observation and experiment embedded in a matrix of theory." The highway was constantly being extended, widened and repaired.

There was scope for the scientist to infiltrate throughout almost the whole business structure to an extent that was at present far from likely to upset the requisite balance. Nevertheless, only from an excess of income over expenditure could industrial expansion be financed. For much of the recent expansion science had laid the foundation, but business had provided the will and the means to build up the high standard of living in this country, which could be maintained only through exports. Britain had therefore a vested interest in economically and politically stable (not static) conditions elsewhere, which would not be achieved if industrialisation of undeveloped countries were obstructed from a misconceived notion that thereby existing markets would no longer be retained. Our survival would therefore depend on the development for export of new products and processes and of the knowledge and experience so gained.

Rule-of-thumb methods and the idea that scientists must be on tap, not on top, were wholly inadequate for the requisite balanced partnership between science and business. Thus, research stimulated developments in other parts of the organisation. Grasp of scientific principles inherent in design and construction fitted technologists or engineers processing creative skill for bridging the gap between the two aspects. Production and operation often needed to be carried out by highly qualified technical men and provided good training for higher management. A scientist responsible for selection, training and promotion could place staff to the best advantage in the various departments. Scientists might be needed for the sale and purchasing of technically complex products and often ensured smoother working with other technical departments. Commercial experience would also provide invaluable training for higher administrative posts.

A truly balanced partnership would manifest itself in the growing use of science and its methods in business, which could come only from a balanced education for scientists and non-scientists alike. The two conceptions of the purpose of education, the development of character, intellect and personality on the one hand and the subordination of the desires of the individual to the needs of society—were not, he believed, wholly conflicting, and the second would not run completely counter to the British tradition of liberty. Balance in education necessitated the humanist having some understanding of science and the scientist to be able to relate his work to its human context, both historically and in terms of the present day. The gulf between the two was much more easily bridged than was sometimes imagined. Both called for intellectual qualities, such as curiosity, judgment and imagination as well as of character.

ATOMIC ENERGY AGENCY

A STOCKTAKING of the International Atomic Energy Agency's first eight months of operations (October, 1957, to the end of June, 1958) is contained in the report which the Board of Governors will present to the second session of the general conference in Vienna on 22nd September. The report is now being distributed to the Agency's 66 member governments.

The main work of the first eight months has been the establishment of an international secretariat competent to undertake many of the Agency's functions. A start has also been made on implementing certain parts of the initial programme. In 1959 it should be possible to make a first assessment of results and to explore new fields of work for the Agency.

The major role foreseen for the Agency was to supply fissionable and source materials and to help to ensure continuing fuel supplies for atomic energy programmes. Fissionable materials offered by member states amount to 5·140 kg of contained uranium 235. Notifications by members indicate that the Agency will also have access in its initial years to adequate supplies of natural uranium and thorium.

Nearly all the technical activities of the Agency include the provision of technical assistance through expert advice by the staff of the Agency, or by special missions consisting of members of the Secretariat or consultants or both, the granting of fellowships and arrangements for the exchange of scientists and experts, and the holding of conferences, seminars and colloquia. The major technical assistance activity already in operation is the Agency's international training programme. Member states were invited to submit their nominations for fellowships to be awarded this year. The first applications are now being examined.

Donations of technical information received by the Agency at the end of June exceeded 40,000 publications and documents. By the end of 1958 it is expected that the scientific and technical library will be operating normally and in a position to provide a variety of services to member states, particularly with regard to the loan or supply of copies of documents, reference lists, etc.

The Agency's scientific and technical documentation service is now established, and plans are being formulated for the dissemination of scientific and technical information. Work has also been started to survey the problem of standardised terminology in nuclear physics and engineering in various languages. Plans are in hand for the publication of an international reactor dictionary dealing with all types of power, research and training reactors now existing or under construction.

With the assistance of an international expert panel the Agency is preparing a provisional manual on safe practices in the use of radio-isotopes. Work has also begun on a general code of regulations on maximum permissible dosages and on the collection and evaluation of data on the disposal of radioactive wastes.

GENERATION AND DEVELOPMENT

C.E.G.B. Granted Injunction

Mr. Justice Elwes in the Vacation Court on 20th August granted an injunction to the Central Electricity Generating Board restraining Mr. R. F. Hillard, of Haines Place, Bewdley Street, Evesham, from obstructing the Board or its agents from entering land owned by Mr. Hillard at Norton and Lenchwick, Worcestershire.

Counsel for the Board stated that his clients had obtained consent to the erection of an overhead line, part of which passed over the defendant's land. The Board had negotiated with landowners for wayleaves and the defendant had given his consent. Subsequently two towers had been erected on his land. The work had caused damage and the Board had paid Mr. Hillard an agreed sum of £175 in respect of this. When the Board came to string the wires on the towers the defendant and his wife prevented the contractors from proceeding with the work and they withdrew. Mr. Hillard had since refused to change his attitude and so the Board asked for the Court's assistance.

Mr. Hillard, who conducted his own defence, said that the Board had no legal right to enter upon his land until he had been paid for a right of way.

Mr. Justice Elwes said that nobody was trying to deprive Mr. Hillard of his legal rights. He had signed a document and had received compensation to which he was entitled. He was now trying, in an illegal way, to stop the Board carrying out its work. The defendant had behaved obstinately and foolishly.

Mr. Hillard undertook not to interfere with the Board again and the Board agree to forgo any claim to damages or costs.

Electricity Supply in July

The Ministry of Power statistics of electricity supply last month, covering all "public" power stations in Great Britain, show a slowing down of the advance. Table I shows that as compared with the corresponding month of last year there was an increase of only 5·2 per cent. This reduces the percentage increase from 11·7 for the first half of the year to 10·9 for the first seven months.

Separate figures supplied by the South of Scotland Electricity Board show that the total energy sent out was 344 million kWh in July last against 347 million in July, 1957, a decrease of 0·9 per cent. The net import from the C.E.G.B. was 34·5 million kWh and from the North of Scotland Hydro-Electric Board 7·7 million kWh. In the first seven months of the year the C.E.G.B. supplied 277 million kWh and the North of Scotland Board 199 million.

The North of Scotland Board in July sent out to its areas 94 million kWh (against 89 million in July, 1957), an increase of 5·5 per cent, in addition to its "export" to the South of Scotland Board. In the twelve months to 31st July the total sent out to the areas was 1,511 million kWh (against 1,360 million), an increase of 11·1 per cent. Supplies to the South of Scotland Board rose by 5·3 per cent to 449 million kWh. The Board commissioned new plant at Dalchonzie during July with a Boving turbine installed by John Brown & Co. and a 4,000 kW Bruce Peebles alternator.

Table 2 analyses sales by the twelve Area Boards in England and Wales.

The national figures show an increase over July, 1957, of 4·8 per cent, but, when corrected for weather conditions and working days, the increase is 6 per cent.

In addition to the public supply, industrial undertakings generated 6,138 million kWh in the 30 weeks ended 26th July—an increase of 2·6 per cent over the corresponding period of 1957.

TABLE 1.—ELECTRICITY GENERATED AND SENT OUT FOR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Electricity G.B.	2,767	60	201·4	6,104	9	6,118	5,733	24,583
North of Scotland H.E.B.	11	—	1·1	21	83	109	107	933
South of Scotland E.B.	190	4	0·1	353	13	366	344	1,473
Total for July, 1958	2,968	64	202·6	6,478	105	6,593*	6,184	26,989
Corres. total for July, 1957	3,179	59	36·2	6,180	86	6,276	5,877	25,384
Inc. or dec., per cent	−6·6	+7·1	+459·1	+4·8	+23·3	+5·1	+5·2	+6·3
Total to date (7 months), 1958	26,995	580	1,063·2	55,623	1,203	56,922	53,545	
Total for corres. 7 months of 1957	25,917	517	196·2	50,147	1,176	51,399	48,296	
Inc. or dec., per cent	+4·2	+12·2	+441·8	+10·9	+2·3	+10·7	+10·9	

* The total figure includes generation by other methods amounting to 10 million kWh.

TABLE 2.—ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for July (million kWh)			Twelve Months Totals Ended 31st July (million kWh)		
	1957	1958	Inc. or Dec. %	1957	1958	Inc. or Dec. %
London	434·4	449·7	+ 3·5	6,936·0	7,558·0	+ 9·0
South Eastern	298·4	330·9	+10·9	4,457·9	5,030·9	+12·9
Southern	384·9	416·5	+ 8·2	5,538·4	6,333·7	+14·4
South Western	205·5	220·9	+ 7·5	2,790·0	3,080·4	+10·4
Eastern	486·2	522·7	+ 7·5	7,195·4	8,036·2	+11·7
East Midlands*	446·8	471·2	+ 5·5	6,147·0	6,701·7	+ 9·0
Midlands*	574·9	591·3	+ 2·9	7,918·5	8,674·6	+10·9
South Wales*	370·9	368·1	− 0·8	4,659·8	4,970·9	+ 6·7
Merseyside and North Wales*	370·7	388·2	+ 4·7	4,841·8	5,256·1	+ 8·6
Yorkshire*	601·0	597·8	− 0·5†	8,030·6	8,630·0	+ 7·5
North Eastern*	348·8	355·8	+ 2·0	4,641·2	5,040·8	+ 8·6
North Western*	586·1	609·1	+ 3·9	8,307·5	8,921·0	+ 7·4
Total all Area Boards	5,108·6	5,322·2	+ 4·2	71,364·1	78,234·3	+ 9·6
Direct Supplies by C.E.G.B.	199·4	241·5	+21·1	2,283·2	2,781·4	+21·8
Grand Total	5,308·0	5,563·7	+ 4·8	73,647·3	81,015·7	+10·0
Mainly Industrial Areas*	3,299·2	3,381·5	+ 2·5	44,446·4	48,195·1	+ 8·4
Mainly Non-Industrial Areas	1,809·4	1,940·7	+ 7·3	26,917·7	30,039·2	+11·6

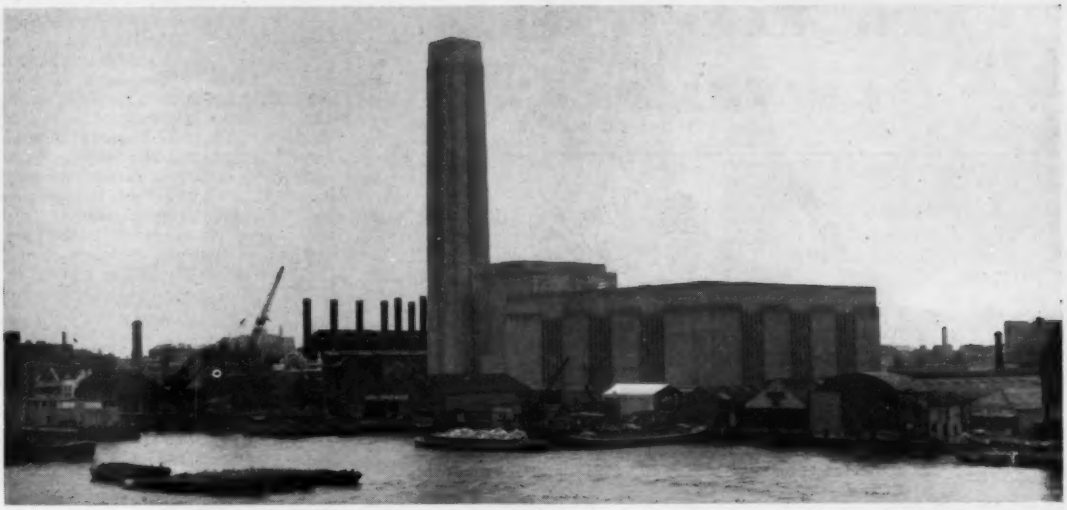
* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.
† The Yorkshire Board is at present temporarily taking a supply from an outside source. If this is allowed for the change would be +2·3%.

Plant for Strathfarrar and Kilmorack Scheme

The North of Scotland Hydro-Electric Board has announced that it will shortly require tenders for water turbo-alternators and the water control gates and equipment for its Strathfarrar and Kilmorack Scheme in Inverness-shire. Tenders are now being awaited for certain civil engineering works connected with the scheme. The project will produce 268 million kWh annually from four power stations having a total installed capacity of 102 MW. To enable the Board to meet future demands of electricity in the Highland area, it is intended that work shall start on the scheme before the end of this year.

Bankside Extension Planned

The Central Electricity Generating Board is to proceed with the second half of the Bankside (Southwark)



Bankside power station, Southwark, the second half of which is now to be built. The chimneys of the original station can be seen on the left

power station on the Thames to the original design of Sir Giles Gilbert Scott. This is an oil-fired station and the first half houses two 60 MW turbo-generators; the second half will have one 120 MW set and its own gas-washing plant.

The extension will involve the demolition of the original Bankside station with its many chimneys. The Board plans to have a garden 240ft long on the river front.

The work is expected to take four years to complete and the cost is put at about £6 million.

Services in Flats

Felling (Co. Durham) U.D.C. is reconsidering the provision of electrical facilities in blocks of flats to be erected in the Wellington Street area. The Council decided originally that all water heating should be by gas, but the North Eastern Electricity Board stated that unless electric water heating was used in a large part of the project, the Council would have to contribute towards the capital cost of supplying the flats with electricity.

Gloucester Cathedral floodlit for the "Son et Lumière," reference to which was made in our last issue. The electrical installation includes 150 lighting units and was carried out by the Strand Electric and Engineering Co., Ltd.

Refrigerators for Council Houses

Hampstead Housing Committee has recommended the purchase, as required, of 250 gas or electrically operated refrigerators at a total estimated cost of £11,250. They will be rented to tenants.

East Midlands Off-Peak Tariff

We have received from the East Midlands Electricity Board particulars of its restricted-hour tariff. This provides for a charge of 0·75d/kWh for energy consumed between 6 p.m. and 7 a.m. and 12.30 and 3.30 p.m. from Monday to Friday and from 12.30 p.m. Saturday to 7 a.m. on the following Monday.

Consumers are required to specify the purpose for which the restricted-hour supply is required and the supply must be confined to this use. Separate circuits must be used and "socket outlets" will not be permitted in these circuits. The Board will provide the metering equipment and a time switch (up to 20 A capacity) for an inclusive rental of 10s 6d a quarter. For a load exceeding 20 A the consumer is required to provide a contactor of sufficient capacity. Consumers may be required to pay a charge in respect of the capital expenditure involved.

Crawley's Fiftieth Year

The 50th anniversary of the public supply of electricity being made available in Crawley (Sussex) was marked on 15th August by the official opening of the South Eastern Electricity Board's new showrooms in the Broadway. The opening ceremony was followed by a luncheon at the George Hotel.

OVERSEAS

American Atomic Aid for Europe

Reuter reports that the United States Congress has passed legislation under which the United States will help Western Europe to develop nuclear power stations to a total of 1,000 MW capacity. One measure approves the Euratom agreement signed by the United States in Brussels on 29th May and another makes available $328 million (£116 million) of United States loans and other assistance to the six-nation atomic pool. This financial aid includes a $135 million (£48 million) Export-Import Bank loan to help construct the European atomic power plants; a $3 million (£1,070,000) grant for research and development; a $90 million (£32 million) guarantee that the atomic fuel furnished by the United States would live up to expectations; and a promise of 9,000 kg of uranium fuel worth $100 million (£35,700,000) to be paid for by instalments.

Nuclear Power in South Africa

A Bill before the South African Parliament provides for the expansion of the board advising the Government on atomic energy to include representatives of industry and commerce. A committee has been set up to investigate the desirability of providing a nuclear power station in the southern part of the Union to reduce the need for coal which has to be carried over a long distance.

NEW ELECTRICAL EQUIPMENT

Mining Transformers

A range of nitrogen-filled sealed pattern mining transformers with Class H insulation, for use underground in coal mines, has been introduced by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17. The units are specially designed, both in shape and size, for convenience of installation underground, and are lighter than conventional oil-filled transformers. They are contained in robust weld-sealed tanks, which are easily cleaned, and are fitted with specially developed metal-seal bushings.

The maximum case temperature is no higher than that of conventional oil-filled units. The nitrogen is under pressure and a special switch is fitted for leak detection and warning.

A further special feature embodied is the flameproof pattern neutral link and fuse chamber, which permits either single fusing, as N.C.B. Specifications P. 108 and P. 109, or double fusing and phase-to-phase excitation of the injection coil.

The transformers are three-phase and have a standard ratio of 3,300 V at no-load, with h.v. tappings for −5 per cent and −10 per cent brought to links in a flameproof pattern oil-filled chamber on the tank end. They are suitable for the reception of standard cable terminations, such as multi-directional cable boxes and plugs and adaptors.

Convector Heater

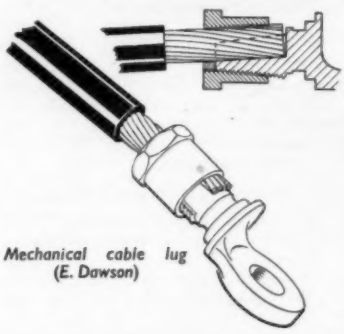
A low-priced convector heater, designed on slim, "contemporary" lines, has been introduced by the Electrical Appliance Division of HURSEAL, LTD., 229, Regent Street, London, W.1. It has a maximum loading of 2 kW and control is by means of a three-heat switch. The height of the heater, including feet, is 25in and it is 28in wide by 2¼in deep.

Hurseal 2 kW convector heater

The finish of the metal panel body of the heater is in cream which contrasts well with the gold coloured anodised metal band of the sides and top and bottom air grilles. The control switch and a neat carrying handle, which folds flat when not in use, are at the back of the heater. Plastic buffers are fitted to the feet to prevent slipping and the marking of floors. The price is £8 3s 11d plus £1 15s 11d purchase tax in the United Kingdom.

Cable Lugs

A new type of mechanical cable lug made by Tegle Bros., of Norway, is now available in this country from the sole distributors, E. DAWSON (LAMP FACTORS), LTD., 10, Grays Inn Road, London, W.1. The cable fits into a recess in the conical stem of the lug and is clamped into position by screwing a metal sleeve over the cable and the conical section. The lug is made from an alloy consisting of 60 per cent copper, 0·3 per cent aluminium and 39·7 per cent zinc. They are available in eight sizes for cables from 25 sq mm to 185 sq mm, 80 to 300 A ratings. The advantages claimed for this lug include labour saving, recovery of the lug from old cable and mechanical clamping which dispenses with hot soldering.



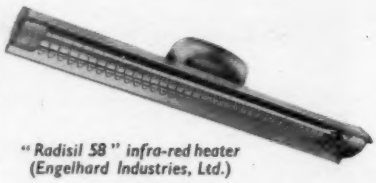
Mechanical cable lug (E. Dawson)

Terminal Blocks

The following additions to the range of terminal blocks marketed by METWAY ELECTRICAL INDUSTRIES, LTD., Metway Works, Brighton, 7, have been announced by the company:—12 way, 10 A grey p.v.c. flexible (TS160/ATG), price 3s 10d each; 12 way, 20 A grey p.v.c. flexible (TS1210/ATG), 7s each; and 12 way, 20 A black hard rubber (TS1210/ATB), 7s each.

Infra-Red Heater

A new infra-red heater, the "Radisil 58," is now in production by the Hanovia Lamps Division of ENGELHARD INDUSTRIES, LTD., Slough, Bucks. Modern in appearance and attractive in any surroundings, it is designed for wall mounting and the range of loadings is 400, 600 and 800 W. The outer cowling is finished in ivory enamel, the reflector is chromium plated and it has a gold-plated grille. The total weight of the unit is 5½ lb; it is 30½in long by 4½in high by 5in deep.



"Radisil 58" infra-red heater (Engelhard Industries, Ltd.)

The simplified mounting bracket is shaped to form an integral part of the design and the element can be changed quickly and easily. Safety in use is assured as the element is completely enclosed and the flex is not exposed. The price is £4 10s plus £1 0s 3d purchase tax in the United Kingdom. Complete replacement elements cost 17s 6d each and heating spirals only 3s 6d.

Low-Frequency Voltmeter

A special type of voltmeter, particularly suitable for very low frequency, three-phase supplies, has been just developed and is now available from CROMPTON PARKINSON, LTD., Crompton House, Aldwych, London, W.C.2. Such a problem arises, for example, when for the operation of nuclear reactor control rods use is made of very low-speed motors on a three-phase supply, the frequency of which varies from zero to 2 c/s. When taking voltage measurements at these low frequencies, the instantaneous value of voltage varies so slowly that the pointer of an ordinary instrument has time to follow it, instead of indicating a steady r.m.s. value.

Crompton Parkinson l.f. voltmeter

The new instrument is basically a d.c. moving coil voltmeter operated from a phase-splitting network with full-wave rectification. This network produces twelve impulses per cycle across the instrument movement, thus

reducing the magnitude of the applied ripple voltage and simultaneously increasing its frequency. Tests have shown that the pointer deviation either side of the mean indication amounts to no more than 0·3 per cent at 2 c/s, 0·7 per cent at 1 c/s and 5 per cent at 0·04 c/s. Both switchboard and portable forms of the instrument are available.

Instrument Racks

The range of instrument racks made by DAVIS & THOMPSON, LTD., Watford By-Pass, Watford, Herts., has been extended and racks are now available in foot heights from 3ft to 7ft, all of which are made in three depths, 15in, 19in and 23in.

These "Datum" racks are designed for housing a variety of electronic equipment and will accommodate standard 19in Post Office fitting panels. Their construction allows considerable adaptability to meet customers' specific requirements. The racks can be used singly or bolted together to form multi-unit installations. Telescopic runners can also be incorporated if required.

"Datum" instrument rack

Ventilation is by air gaps at the bottom of the termination panels. If forced draught ventilation is required, suitable panels can be provided. Where no ventilation is necessary, reversed panels close the normal air gaps, and additional sealing can be applied.

Signalling Lamp

A lightweight high intensity traffic control signalling lamp now being marketed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has a maximum intensity of 130,000 candelas. It has been tested successfully over a distance of four miles, transmitting signals into bright sunlight. The lamp, which weighs 4½ lb, has been designed for easy use in the hand, and with an overall diameter of 7in and a barrel length of 7¾in, it can be operated in the confined space of a control caravan.

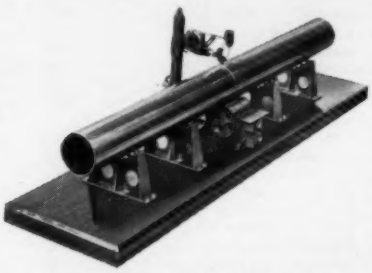
The lamp (G.E.C. ZA.702) houses a 6¾in diameter anodised aluminium reflector which produces a narrow, well-defined beam thus minimising the risk of signals being received by two adjacent aircraft simultaneously. The shutters are actuated by a spring-loaded mechanism, the trigger of which is incorporated in the pistol-grip handle.

By rotating an additional handle beneath the front of the lamp, red or green screens are brought into position over the normal white light while the lamp is held steadily in both hands. An indication of the colour being transmitted appears through an aperture at the rear of the lamp housing beneath the eye-piece of the sighting unit.

Pipeline Welding

A development which, it is claimed, will speed up the process of pipeline welding on site, is announced by QUASI-ARC, LTD., Bilston, Staffs. This enables two 30-40ft lengths of pipe to be welded together automatically, after which the double length is joined to the pipeline by conventional manual stove-pipe welding methods.

The length of pipe is supported on two idler units, each of which incorporates six ball castors arranged in V-formation. This method of mounting not only enables the pipe to be rotated for welding but allows it to be withdrawn in the longitudinal direction. It also means that pipes of 6in to 38in in diameter can be accommodated without any adjustment. The two pipes to be butt-welded are loaded on to the idler units with their ends butting together, and are rotated by two pairs of large diameter rolls, each pair being driven by a ½ h.p. motor.

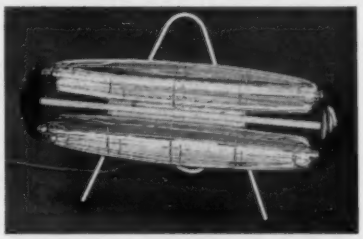


A model of the Quasi-Arc pipe "double-ending" machine for automatic butt-welding of pipeline joints on site

The two motors are supplied with d.c. from a motor-driven generator with Ward-Leonard control, and reduction gearing enables the welding speed to be varied from 7in to 70in per minute.

Infra-Red Heaters

Following the introduction of their 750 W domestic infra-red heater at the beginning of this year, DIMPLEX, LTD., Millbrook, Southampton, have now developed a range of infra-red fires, basically made to the same specifications. They provide beamed heating on a broad front and as the elements are totally enclosed are claimed to be perfectly safe in use. The tubular stands of the domestic heaters are stoved enamelled in white or cream



Dimplex model IRF 1500 1½ kW domestic infra-red fire

(bronze for the copper colour finish) as standard. Model IRF 750 (750 W) measures 32in long by 9¼in high by 10in deep and is priced at £5 10s plus £1 4s purchase tax. Model IRF 1500 (1½ kW) has the same length but is 17¼in high by 9½in deep. The price is £9 plus £1 19s 6d tax.

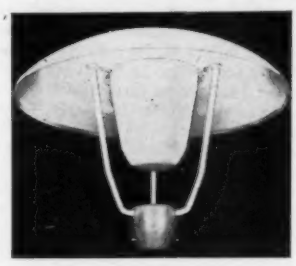
The two commercial type heaters, in 750 W and 1½ kW loadings, are suitable for ceiling mounting only (by chain or conduit) and are priced at £5 and £8 respectively.

Outdoor Lighting Fitting

The BENJAMIN ELECTRIC, LTD., Brantwood Road, Tottenham, London, N.17, have produced a "Mushroom" lighting fitting for outdoor use in two sizes, with 30in or 36in diameter reflectors. The fitting has an aluminium top hood attached to the main reflector which is supported on three tubular arms from a cast spigot cap at the base. The porcelain lampholder is attached to the main reflector by a strap and the flashed opal globe is fitted to the main reflector with a gasket and bezel ring having three slotted lugs engaging with captive knurled screws.

Grey stoved enamel is used for the finish of the "mushroom" and spigot cap; the arms and bezel ring are white stove enamelled; and the underside of the main reflector is in white "Crysteel" enamel. Tungsten, fluorescent or sodium lamps can be used with the fitting.

Benjamin "Mushroom" fitting



Financial Section

STOCKS and SHARES

INTEREST in the Stock Exchange has been astonishingly active during this holiday month, and the extent of the resultant rise in share prices has also been much larger than most people would have cared to predict a month ago, when the Iraq trouble was the principal influence. Relaxation of the Middle East tension contributed, of course, a great deal to the revival of investment confidence, which was further encouraged by the latest Bank Rate reduction. Reports on industrial conditions give a rather sober aspect to the outlook for this year's company earnings and dividends, and the recent mood of the market has been to overlook this in favour of brighter considerations. There was a noticeable hesitation in markets, however, upon the appearance of the Cohen Council's second report on economic affairs.

Further Gains

Many more electrical shares had moved up to their best prices of the year by the beginning of this week. Among them, B.I.C.C. gained a florin for the second week in succession, reaching 47s. Others to improve further by between two and three shillings included Hoover, British Aluminium, British Tabulating Machine and Decca. In the heavy engineering group, Clarke Chapman were outstanding with a recovery of 5s., to 63s 9d and John Thompson went higher after the news of the company's bid for Thompson Brothers (Bilston). Brook Motors added 1s 9d to previous advances, and there were also gains generally in the radio shares. British Vacuum Cleaner were marked up from 6s 6d to 7s 9d after the announcement of a proposed 100 per cent scrip issue, and Bulpitts rose to 8s 3d. Among the many shares to gain a shilling or so were Switchgear & Cowan, Automatic Telephone, Strand Electric and Southern Areas.

Crompton Parkinson

One of the most notable of this month's many large price improvements in the electrical market has been the rise in Crompton Parkinson 5s shares from about 10s 3d to nearly 12s. The company makes up its books at the end of June, and if the last precedent is followed the financial results, together with the final dividend recommendation, will appear by the end of October. On account of the latest year the interim dividend, payable on capital increased by a one-for-two scrip issue, was raised from the equivalent of 4 to 5 per cent. Shareholders were advised not to take this as an indication of a larger distribution for the whole year. The 16 per cent total paid for 1956–57 is equivalent to a rate of 10⅝ per cent on the present ordinary capital of £5·8 million. On that basis the shares are showing a yield of approximately 4½ per cent.

A.E.I. Progress

Publication of Associated Electrical Industries' interim report, covering the six months to last June, had initially no

Price Changes in

Company or Board	Nom. Value	Middle price 25th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1958 Highest	1958 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	76	−½	3	3	3 19 0	76½	72
Brit. Elec. 1974/77	100	72	−½	3	3	4 3 3	73½	68½
Brit. Elec. 1976/79	100	77½		3½	3½	4 10 3	77½	72
Brit. Elec. 1974/79	100	85½xd		4½	4½	4 19 6	87½	82½
Overseas Electric Supply								
Calcutta Elec.	£1	16/6		6†	6·8†	8 5 0†	16/9	15/-
East African Power	£1	21/-		7½	8	7 12 6	21/-	17/6
Nigerian Elec.	£1	12/6		10	10	16 0 0	17/-	12/6
Perak Hydro-Elec.	£1	15/-	+6d	10	12½	16 13 6	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	13/3	+6d	17½	17½	6 12 0	13/3	9/9
Aerialite	1/-	7/3		48	51½	7 2 0	7/3	5/1
Allen, W. H.	£1	37/3		10	11	5 18 0	37/3	32/9
Anglo-Portuguese Tel.	£1	27/9	+9d	8	9	6 9 9	27/9	19/9
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	57/6	53/-
Assoc. Elec. Ord.	£1	53/9	+1/3	15	15	5 11 6	53/9	46/6
Automatic Tel. & El.	£1	68/9	+1/3	17	17	4 18 9	68/9	57/-
Babcock & Wilcox	£1	49/-		15	13‡	5 6 0	52/9	41/9
Bakelite	10/-	19/3		15	15	7 15 9	21/-	17/6
Baldwin, H. J.	2/-	2/9	+3d	20	20	14 10 9	3/9	2/6
Berry's Electric	5/-	7/3	+3d	10	10	6 18 0	7/6	5/9
British Aluminium	£1	53/3	+2/-	12	12	4 10 3	53/3	37/-
Brit. Elec. Traction: Def. Ord. "A"	5/-	29/-	+1/-	25	25	4 6 3	29/-	19/6
B.I. Callender's	£1	47/-	+2/-	12½	12½	5 6 6	47/-	38/9
B.I. Callender's 6% Pref. ...	£1	19/-		6	6	6 6 3	20/3	19/-
British Tabulating	£1	53/9	+2/6	9	10	3 14 6	53/9	38/6
British Thermostat	5/-	30/-		25	30	5 0 0	30/-	19/9
British Vac. Cleaner	5/-	7/9	+1/3	10	10	6 9 0	7/9	4/6
Brook Motors	10/-	41/3	+1/9	25	25	6 1 3	41/3	33/3
Bulgin, A. F.	1/-	5/6	+3d	40	45	8 2 9	5/6	4/7
Bulpitts	5/-	8/3	+6d	—	12½‡	7 11 6	8/3	7/3
Burco Dean	5/-	9/6	+3d	20	22½	7 18 0*	9/6	7/9
Cable & Wireless: Ord.	5/-	10/9		10	10½*	4 13 0	10/9	8/-
4% Loan	100	94	+½	4	4	4 5 0	94½	89
Chloride El. Storage "A" ...	£1	60/-	+6d	17½	17½	5 16 9	62/-	55/6
Clarke Chapman	£1	63/9	+5/-	27½	27½	4 6 3*	72/6	55/-
Cole, E. K....	5/-	16/6	+9d	17½	17½	5 6 0	18/-	15/3
Cossor, A. C.	5/-	6/-	+3d	Nil	2½	2 1 9	6/-	4/4
Crabtree	10/-	28/6		20	20	7 0 3	28/6	24/4
Crompton Parkinson Ord. ...	5/-	12/-	+1/-	16	16	4 9 0*	12/-	8/3
De La Rue	10/-	24/6	+9d	35	17½*	7 2 9	26/3	20/9
Decca "A"	4/-	28/9	+3/-	43½	43½	6 1 9	28/9	21/3
Desoutter	5/-	16 6		32½	18½*	5 13 9	16 6	13/6
Dewhurst	2/-	8/3	+3d	16½	20	4 17 0	8/3	6/9
Dictograph Tel.	2/-	6/9		20	20*	5 18 6	6/9	4/7
Dubilier Condenser	1/-	3/6		30	20*	5 14 3	4/3	3/1
Duport	5/-	8/6	+3d	25	25	7 7 0*	9/4	7/9
E.M.I.	10/-	38/6		15	15	3 18 0	39/6	27/6
Electrical Components	5/-	8/-		12½	12½	7 16 3	8/-	7/-
Elec. Construction	£1	23/9		8½	8½	7 3 3	25/-	21/-
Elliott-Automation	5/-	15/9	+9d	—	10‡	3 3 6	15/9	11/6
Enfield Cable Ord.	£1	14/6	+6d	Nil	2½	3 9 0	17/-	10/9
English Electric	£1	56/3xd	+6d	14	14	4 19 6	56/3	44/-
English Electric 3½% Pref. ...	£1	12/6		3½	3½	6 0 0	12/6	11/9
Ericsson Tel.	5/-	22/9	+6d	22†	12*†	2 12 9†	22/9	17/6
Ever Ready	5/-	19/6	+6d	37½	20*	5 2 6	19/6	13/9
Falk Stadelmann	£1	36/3		17½	17½	9 13 0	38/9	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

very marked effect upon the company's £1 shares. At 53s 9d they showed a further net gain of about 1s 3d over the week, having changed hands up to 54s 9d. While the value of the group's output increased by about 14 per cent, in comparison with the first half of 1957, trading profits improved by a fraction over 3 per cent, the implication being that profit margins continued to contract. After the deduction of a larger charge for depreciation, the net figure of £4·84 million (before tax) was about £160,000 below the surplus in each of the two preceding half years. From these figures it is calculated that earnings are running at the equivalent of a little over 20 per cent on the ordinary capital. The company is paying a second quarterly dividend of 2½ per cent, as for last year, when the total distribution was brought up to 15 per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 25th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	36/3	+9d	12½	10	5 10 3	38/9	29/3
G.E.C. 6½% Pref.	£1	21/-		6½	6½	6 3 9	21/3	20/3
General Cables	5/-	9/3		30	24	—	11/9	9/3
Greenwood & Batley	£1	48/3		17½	20	8 5 9	48/3	45/-
Hackbridge Holdings	5/-	13/3xd		20	20	7 11 0	14/3	7/6
Hackbridge & Hewittic	5/-	13/-	+9d	20	20	7 13 9	13/-	9/7
Head Wrightson	5/-	22/-	+9d	22½	17½*	3 19 6	22/3	16/9
Heatrae	2/-	7/-	+6d	15	20	5 14 3	7/-	4/-
Henley's	10/-	12/6		11½	11½	9 4 0	14/6	10/6
Holophane	5/-	13/9		30	37½	8 2 9*	13/9	12/6
Hoover	5/-	45/-	+2/-	50	50	5 11 0	45/-	31/-
I.C.I.	£1	33/6	+9d	10	12	4 15 6*	33/6	23/9
Intl. Combustion	5/-	27/-		22½	25	4 12 6	27/-	19/3
Johnson & Phillips	£1	18/9	−6d	10	5	5 6 9	25/-	15/-
Lancashire Dynamo	£1	40/-xd	+6d	11	11	5 10 0	40/-	28/6
Laurence Scott	5/-	15/3	+6d	15	15	4 18 3	14/9	12/6
Lister, R. A.	£1	26/3	+9d	10	10	7 12 6	26/3	23/-
London Elec. Wire	£1	46/9		12½	12½	5 7 0	46/9	39/6
Lucas, J.	£1	39/-	+1/-	7½	7½	3 17 0	39/-	27/9
Marconi Marine	£1	34/-		10	10	5 17 9	34/-	29/-
Marryat & Scott	2/-	6/9		35	37½	5 11 0	14/-	10/3
Mather & Platt	£1	39/6		15	15	5 1 3*	40/-	29/6
Metal Industries	£1	35/9	+1/3	9	14	7 16 6	35/9	22/9
Midland Elec. Mfg.	£1	47/6		12½	12½	5 5 3	48/3	44/-
Morphy-Richards	4/-	18/6	+1/3	50	20*	4 6 6	18/6	14/6
Murex	£1	50/6	+2/6	20	17½	6 18 6	58/3	48/-
Newman Ind.	2/-	2/3		10	10	8 17 9	2/9	2/3
Oldham & Son	1/-	2/6		17½	17½	7 0 0	2/7	2/3
Parnall (Yate)	5/-	17/6		12	12	3 8 6	17/6	5/9
Parsons, C. A.	£1	48/9	−6d	8½	7½*	3 1 6	53/6	43/-
Plessey	10/-	63/3	+1/3	30	30	4 14 9	63/3	55/-
Pye "A" Deferred	5/-	14/6		12½	12½	4 6 3	14/6	10/-
Reyrolle	£1	80/-		17½	17½	4 7 6	84/6	73/6
Rheostatic	4/-	7/-	+1/-	12½	12½	7 2 9	8/-	6/-
Richardsons Westgarth	10/-	14/6	+3d	16½	8½*	5 15 0	15/-	13/-
Scottish Cables	4/-	10/9	+6d	27½	27½	5 19 0*	10/9	7/-
Simon-Carves	5/-	28/9	+6d	20	25	4 7 0	28/9	22/6
Smith (England), S.	4/-	10/-	+3d	17½	20	4 0 0*	10/-	7/-
Southern Areas	£1	10/9	+1/-	7½	Nil	Nil	13/9	9/3
Strand Elec.	5/-	5/9	+1/-	15	15	13 0 9	6/3	4/9
Sturtevant	5/-	15/3		15†	15†	4 18 3†	18/-	14/9
Sun Elec.	£1	51/3	+1/3	25	25	9 16 3	51/3	47/3
Switchgear & Cowans	5/-	14/6	+1/-	25	22½	7 16 3	14/6	8/9
Taylor Tunnicliff	5/-	14/3	+6d	15	17½	6 2 9	14/3	11/9
T.C.C.	10/-	32/6		25	25	7 13 9	38/6	32/6
T.C. & M.	£1	24/6	+1/-	8½	8½‡	6 18 9	27/-	20/-
Telephone Mfg.	5/-	5/-	+3d	10	10	10 0 0	5/3	4/6
Telephone Rentals	5/-	13/6	+1/-	12½	12½	4 12 6	13/6	9/9
Thompson (John)	5/-	25/-	+1/-	25	25	5 0 0	27/-	23/-
Thorn Elec. "A"	5/-	20/-xd		17½	17½	4 7 6	23/3	17/-
Thornycroft	£1	25/-		12½	12½	10 0 0	27/9	21/-
Tube Investments	£1	58/3	+1/6	13½	15	5 3 0	58/3	48/3
Vactric	5/-	24/-		25	25	5 4 3	24/9	14/3
Veritys	5/-	5/3		12½	12½	2 7 6	6/9	5/3
Walsall Conduits	4/-	15/3		20	22½	5 18 0	15/3	11/-
Ward & Goldstone	5/-	29/-	+6d	40	25*	4 6 3	29/6	23/6
Watford	2/-	6/6	+3d	25	25	6 3 0*	7/6	5/-
Westinghouse	£1	38/-		18	10*	5 5 3	40/-	32/3
West, Allen	5/-	12/3	+3d	15	12½*	5 2 0	12/3	9/3
Wolf Electric	5/-	8/3	+6d	20	10*	6 1 3	9/-	6/9

Commercial Television

Interest in the shares of companies concerned with commercial television has been sustained at a fairly high pitch. Suspension of dealings in Granada Theatre shares, which have no official listing, attracted a lot of publicity but concerned only a small circle. This event subdued to some extent the activity in the "A" shares of Associated Television, which are also dealt in for the present under a special rule. Among shares credited with direct or indirect connections with the industry, Pye "A" deferred continued to be well supported up to 14s 6d, Rediffusion moved up to 30s, and Reliance Clifton Cable to 15s. B.E.T. shares were also in favour.

British Electric Traction

The rise in the price of the 5s "A" deferred shares of British Electric Traction, has been a recent feature of the industrial market. They have advanced from 23s to 29s since the annual results were published in the early part of July. Net profits attributable to the company were shown then to have contracted slightly, but the dividend was maintained with no difficulty at 25 per cent for the year. In his review at the annual meeting, Mr. H. C. Drayton spoke very encouragingly of the progress made by Associated Rediffusion. Through a major shareholding in this company, B.E.T. have a large stake in commercial television and expect to receive dividends from it in the current year. A substantial increase in this year's income—subject to unforeseen events—was anticipated by the chairman.

Oldham & Son Report

Turnover of Oldham & Son was substantially maintained during the year ended last March, and a reduction of about 25 per cent in the parent company's earnings is ascribed in the annual report to increased expenditure on technical development and sales promotion, the full benefit of which has yet to materialise. For the group as a whole, the net profit came out £44,000 lower at £412,000. This permits the company to maintain the dividend very comfortably at the previous total of 17½ per cent, which involves the distribution of only one-third of the net surplus after tax. In his review, the chairman notes that more than 30 per cent of the last year's production went into direct exports, and emphasises the importance of the company's success in developing overseas markets. Quoted at 2s 6d, the 1s shares offer a yield of 7 per cent.

REPORTS and DIVIDENDS

Electrical Components (Holdings), Ltd.—The report and accounts now issued confirm the preliminary figures given in our issue of 8th August. In his circulated statement, Mr. L. S. Seccombe (chairman), after referring to the recent acquisition of Santon (Wholesale), Ltd., says that the increase in business during the year under review was well distributed over the whole range of the group's electrical side, but there has been some decline in the turnover of radio and television sets, which has always been the more fluctuating and speculative branch of the trade. There was a small decline in the turnover of the first three months of the current year; the expansion of television and radio appears to have reached a halt, and there are indications of a changing pattern of distribution in some sections of the electrical industry, which could have the effect of curtailing profit margins in some sections.

The Dubilier Condenser Co. (1925), Ltd.—The annual meeting was held on 20th August, Mr. F. H. McCrea (chairman and managing director) presiding. In his statement, which had been previously circulated, Mr. McCrea said that during the last quarter of the financial year under review, trading conditions became less favourable due, in some measure, to the action taken by the Government to prevent inflation. This resulted in the sales turnover for the year not reaching the target figure they had in mind. The reduction in the demand by the Defence Ministries was partly rectified by increased sales in other branches. A substantial volume of export business was obtained under highly competitive conditions. One of the chief obstacles to the expansion of overseas trade was import restrictions, particularly in India, Australia and New Zealand, where they had established a valuable market. The development of new types of capacitors and resistors required to meet a wide variety of applications was on an increasing scale.

British Industrial Plastics, Ltd., is to issue, subject to market conditions, 2,250,000 2s ordinary shares at 4s 6d each. The issue will be made early in September. Ordinary shareholders will have the right to take up 2,081,353 shares in the proportion of one for every six held. The remaining 168,647 shares will be offered to Fenn & Crosthwaite, stockbrokers, at the same price in consideration of their underwriting the issue.

Associated Electrical Industries, Ltd.—The progress report for the six months ended 30th June last shows group trading profits of £6·99 million as compared with £6·76 million for the corresponding period of 1957. Due to higher depreciation provision of £2·15 million, the net trading profit is lower at £4·84 million (against £5 million). Orders received, mainly for delivery within three years, totalled £80·2 million (against £84·5 million). A second interim dividend of 2½ per cent has been declared on increased capital, making 5 per cent to date (unchanged).

The British Vacuum Cleaner & Engineering Co., Ltd., proposes to make an issue, by way of capitalisation of reserves, of 1,200,000 ordinary shares of 5s each credited as fully paid up to the holders of the existing 1,200,000 ordinary shares in the proportion of one new ordinary share for each ordinary share held. The directors emphasise that they see no prospect of being able to recommend the distribution by way of dividend in respect of the current financial year of a greater sum than was distributed in respect of the previous year.

Dowty Group, Ltd.—The annual meeting will be held on 15th September. In his circulated statement, Sir George Dowty (chairman) says that their work for the Berkeley reactor is proceeding to programme, and they are now engaged on new designs of equipment for reactors being projected for this country and overseas. Dowty Nucleonics, Ltd., has excellent relations with the British nuclear engineering consortia.

A. C. Cossor, Ltd., reports a group loss for the year to 31st March last of £14,516, as compared with a profit of £190,396 for 1956-57. It is stated that although the results of the radar, electronics, cables and instruments business, and also operations in Canada, showed satisfactory profits, these were more than offset by losses on operations in radio and television, where a heavy recession in trade in the later part of the year, together with severe price competition, resulted in reduced profit margins below an economic level. The group loss attributable to A. C. Cossor, after taxation of £22,618 is £44,112 (against a profit of £106,208). Subsidiaries retained £8,482, leaving a net loss of £52,594 (profit of £85,648). No dividend is being paid for the year on the ordinary shares (against 2½ per cent).

The Automatic Telephone & Electric Co., Ltd., has declared an interim dividend of 5 per cent (unchanged) on increased capital.

The Rheostatic Co., Ltd., is paying an interim dividend of 5 per cent (unchanged).

New Companies

Cardigan Radio, Ltd.—Registered 13th August. Capital £2,000. Manufacturers of and dealers in radio, electrical and mechanical apparatus of all kinds, etc. Directors: G. Richards, Alice L. Richards, G. Richards and Noreen Richards. Regd. office: 323, Kirkstall Road, Leeds, 4.

Dormer & Wadsworth (Electronics), Ltd. Registered 12th August. Capital £3,000. Manufacturers of and dealers in electronic and electrical instruments, etc. Directors: W. A. W. Williams, C. B. Bovill, D. M. Constant and S. J. Billings. Reg. office: 51-53, Bickersteth Road, S.W.17.

N. R. Kirk (Contractors), Ltd. Registered 8th August. Capital £100. Electrical engineers and general electrical installation contractors, etc. N. R. Kirk is the first director. Reg. office: 2/4, Uttoxeter New Road, Derby.

N. R. Kirk & Co. (Derby), Ltd. Registered 8th August. Capital £100. Other particulars are similar to N. R. Kirk (Contractors), Ltd.

Sheppard Electronics, Ltd.—Registered 7th August. Capital £10,000. Manufacturers of electrical, electronic and other machinery, plant and equipment, etc. Solicitors: Denton Hall & Burgin, 3, Gray's Inn Place, W.C.1.

Burrett, Ltd.—Registered 7th August. Capital £100. Manufacturers of and dealers in electrical fittings, lamp shades, etc. Regd. office: 29/31, Euston Road, London, N.W.1.

Electroservice (R. W. Taylor), Ltd.—Registered 7th August. Capital £100. Electrical engineers and dealers in radio and television sets, etc. R. W. Taylor is the first director. Regd. office: 37, Queen Anne Avenue, Bromley, Kent.

Malvern Electronic Instruments, Ltd.—Registered 7th August. Capital £100. Manufacturers of and dealers in electrical apparatus and fittings, etc. Directors: Henna Lewis and Joyce Lewis. Regd. office: 49, Malvern Road, Nottingham.

Gate Electronics (Manufacturing), Ltd.—Registered 1st May. Capital £100. Manufacturers, importers and exporters of and dealers in apparatus and accessories for use in connection with the generation, accumulation, transmission, utilisation and supply of electrical energy, etc. Directors: L. A. Smulian and M. W. Kaye. Regd. office: Tudor Grove, E.9.

William Hockley, Ltd.—Registered 11th July. Capital £500. Electrical engineers, electrical wiring and installation contractors, radio and television engineers, etc. W. Hockley is the first director. Regd. office: 89a, Spon End, Coventry.

Balfour Electronics, Ltd.—Registered 11th July. Capital £1,000. Directors: B. Smith, S. E. Norman, L. E. Norman and C. H. Jones. Regd. office: 2, Station Road, Ilford, Essex.

Maitland Electrical, Ltd.—Registered in Edinburgh 10th July. Capital £10,000. Electrical experts and engineers generally, etc. Directors: F. J. Nickel and Mrs. A. S. Nickel. Regd. office: 4, Gayfield Place, Edinburgh.

J. Garner & Sons, Ltd.—Registered 14th July. Capital £100. Electrical, radio, television and refrigeration engineers, etc. Directors: J. S. Garner and Pauline A. Garner. Regd. office: 153-5, Hamlet Court Road, Westcliff-on-Sea.

William Thersby & Sons, Ltd.—Registered 15th July. Capital £5,000. Manufacturers of and dealers in electrical, electronic and mechanical devices, transformers, motors, dynamos, etc. Directors: W. Thersby and Mrs. Mary H. Thersby. Solicitors: J. A. Dixon & Son, Gateshead.

Pead Electronics (Berkeley), Ltd.—Registered 17th July. Capital £1,000. To acquire the business of manufacturers, sellers and servicers of radio, television, electrical and electronic appliances carried on by S. G. and B. F. Pead at Market Place, Berkeley, etc. Directors: S. G. Pead and Brian F. Pead. Regd. office: Canonbury Street, Berkeley, Glos.

R. G. Bruce, Ltd.—Registered 6th August. Capital £2,000. Electrical engineers and contractors, etc. Directors: R. G. Bruce and Mrs. Phyllis E. M. Bruce. Regd. office: 7, Harris Road, Stoke, Coventry.

A. J. Briscoe & Co., Ltd.—Registered 6th August. Capital £5,000. Radio, television, telephone and telegraphical engineers, etc. Directors: A. J. Briscoe and R. M. Briscoe. Solicitors: Gregson & Ashton, Liverpool.

Berna Industries, Ltd.—Registered 30th July. Capital £3,000. Electricians, radio engineers, electrical engineers, etc. Direc-

tors: B. J. Brown and Mrs. Beatrice Brown. Regd. office: Number 5 Factory, Lancaster Road, High Wycombe.

A. G. Purdy & Sons, Ltd.—Registered 6th June. Capital £2,000. To acquire the business of A. G. Purdy & Sons carried on by A. G., C. H. W. and R. G. Purdy at 430, Lewisham High Street, S.E.13; to carry on the business of electrical engineers, electricians, electronics engineers, radio and television engineers, etc. Directors: A. G. Purdy, C. H. W. Purdy and H. A. E. Purdy. Regd. office: 35/7, Bow Road, E.3.

E. R. Beacon (Electrical Contractors), Ltd.—Registered 6th June. Capital £2,000. Directors: E. R. Beacon and Mrs. Lilian M. Beacon. Regd. office: "Engadin," Cannock Road, Westcroft, Wolverhampton.

J. F. Shears, Ltd.—Registered 6th June. Capital £1,000. Electrical engineers, general electrical and refrigeration installation contractors, manufacturers of and repairers and dealers in wireless and television sets, etc. Directors: J. F. Shears and Winifred J. Shears. Regd. office: 57, Crown Way, Royal Leamington Spa, Warwicks.

Technicon Instruments Co., Ltd.—Registered 13th June. Capital £100. Mechanical and electrical engineers, manufacturers of and dealers in scientific instruments and apparatus of all kinds, etc. Solicitors: E. F. Turner & Sons, 115, Leadenhall Street, E.C.3.

Liquidations

T.B.R. Electrical, Ltd., electrical engineers, 430, Strand, London, W.C.2.—Winding up voluntarily. Liquidator, Mr. M. Rabin, 18, St. George Street, Hanover Square, London, W.1, appointed 14th July.

Empire Electric Co. (Hounslow), Ltd., 189, Hanworth Road, Hounslow, Middx., electrical equipment specialists.—First and final dividend of 6s 1d in the £, payable at Bank Chambers, 1, John Street, Bedford Row, London, W.C.1.

Bankruptcies

J. E. Hunt, 24, King Arthur Street, Peckham, London, S.E.15, electrician, lately residing at 74, Griffin Road, Plumstead, London, S.E.18.—Receiving order made 6th August, on a creditor's petition.

G. W. Altass, 1, Bruce Avenue, Shepperton, Middx., electrical engineer and general contractor.—Order made on 13th December, 1955, varied in that the instalments of £250 a quarter payable under that Order shall be reduced to £30 a quarter, the first payment to be made on 29th September, and subsequent payments on the usual quarter days following until the balance of £975 due under the judgment be satisfied.

K. J. Rodgers, trading as Castle Engineering at The Crofts, Moorgate, Rotherham, electrical contractor.—Trustee, Mr. P. Cardwell, 93, Queen Street, Sheffield, 1, appointed 12th August.

E. Newland, electrical contractor, 130, Grove Road, Chadwell Heath, Romford, Essex.—Trustee, Mr. D. A. Jacobs, 18, Bentinck Street, London, W.1, released 5th August.

J. W. Luker and **H. A. R. Phillips**, lately carrying on business in partnership at East Street, Lewes, Sussex, and 206, High Street, Lewes, under the style of Gordon and Luker, electrical contractors.—Supplemental dividend of 3¼d in the £, payable at the Official Receiver's office, 8, Old Steine, Brighton, 1.

J. H. Dakin, 13, Church Road, Edgbaston, Birmingham, electronic engineer, lately carrying on business at 140, Great Charles Street, Birmingham.—Public examination 15th October at the Court House, Corporation Street, Birmingham, 4.

G. A. Adams, previously carrying on business, at first in partnership with another, at 90, Jamaica Row, Birmingham, and latterly from 1, Ings Road, Wombwell, East Riding, Yorks., also, under the style of Electro-Neon Lighting Co., electrical contractor.—Last day for receiving proofs for dividend 3rd September. Trustee, Mr. W. H. Haigh, Official Receiver's Office, Somerset House, 37, Temple Street, Birmingham, 2.

CATALOGUES AND LISTS

CABLES.—Descriptive leaflet giving particulars of compensating cables for pyrometry.—**Mersey Cable Works, Ltd.**, Linacre Lane, Bootle, Liverpool, 20.

CABLE CLEATS.—Illustrated eight-page catalogue (287B) dealing with the company's claw type cable cleating system.—**British Insulated Callender's Cables, Ltd.**, 21, Bloomsbury Street, London, W.C.1.

CABLE TRUNKING.—12-page catalogue (T3/1/58) dealing with the company's range of cable trunking with "Quick Fix" covers.—**Davis Sheet Metal Engineering Co., Ltd.**, Eley's Estate, Angel Road, Edmonton, London, N.18.

COOLING TOWERS.—15-page booklet illustrating cooling towers designed and manufactured by the company.—**Head Wrightson Processes, Ltd.**, Teesdale House, 24-26, Baltic Street, London, E.C.1.

28-page catalogue containing illustrations and descriptions of cooling towers which have been designed and built by the company.—**Film Cooling Towers (1925), Ltd.**, Lionel Road, Kew Bridge, Brentford, Middlesex.

ELECTRIC CLOCKS.—Folder illustrated in colour and describing the range of Schatz "Contour" battery-operated wall clocks.—**Anglo Time Corporation**, 19-21, Hatton Garden, London, E.C.1.

FEEDER PILLARS.—Illustrated catalogue (396) dealing with the company's range of standard and dwarf type feeder pillars.—**British Insulated Callender's Cables, Ltd.**, 21, Bloomsbury Street, London, W.C.1.

FURNACES.—Leaflet dealing with bench type muffle furnaces for laboratory and workshop use.—**Metalectric Furnaces, Ltd.**, Smethwick.

INSTRUMENTS. — 96-page catalogue with text in English, French, German and Spanish covering the company's range of telecommunication test gear and a descriptive folder giving particulars of the new TF1300 vacuum tube voltmeter.—**Marconi Instruments, Ltd.**, St. Albans, Hertfordshire.

LAUNDRY EQUIPMENT. — Illustrated leaflet describing "Electrolux" laundry equipment.—**Electrolux, Ltd.**, 153/5, Regent Street, London, W.1.

LIGHTING FITTINGS.—Two leaflets and price list covering decorative table lamps and shades in the company's "Philora" range.—**Philip S. Schulman, Ltd.**, 72-76, Laindon Road, Rusholme, Manchester, 14.

MICROPHONES. — Illustrated catalogue (1459) covering microphones, stands and accessories for telecommunications, television, broadcasting and public address systems, etc.—Lustraphone, Ltd., St. George's Works, Regent's Park Road, London, N.W.1.

MOTOR CONTROL GEAR.—Illustrated folder dealing with the company's range of flush mounting starters and special built-in accessories.—**Allen West & Co., Ltd.**, Brighton.

MOTORS.—Illustrated 8-page booklet dealing with Series "T" f.h.p. motors.—**Crompton Parkinson, Ltd.**, Crompton House, Aldwych, London, W.C.2.

Folder in the shape of one of the company's type "C" drip-proof motors which opens out to give an exploded view of the machine's construction.—**Brook Motors, Ltd.**, Huddersfield.

OUTDOOR CUT-OUTS. — Illustrated brochure (F.S.P.2) dealing with high-voltage expulsion fuse cut-outs.—**Line Equipment, Ltd.**, Bridgend, Glam.

RADIATION MONITOR. — Brochure describing and illustrating in colour the company's hand and clothing monitor Type 1.—**E.M.I. Electronics, Ltd.**, Hayes, Middlesex.

RELAYS.—Leaflet giving particulars of the company's "Motoload" relay designed to sense the torque of a driving motor for protection and similar purposes.—**Radiovisor Parent, Ltd.**, Stanhope Works, High Path, London, S.W.19.

SHOPBLINDS.—Brochure giving particulars of the "Electromatic" electrically operated shopblind for operation by press-button or by photoelectric control unit.—**Electromatic Shopblinds, Ltd.**, 201, Eade Road, Finsbury Park, London, N.4.

TELEPHONES.—Brochure illustrated in colour and dealing with the "Automaster" loud speaking telephone designed for use with private automatic telephone equipment.—**Communications Systems, Ltd.**, Norfolk House, Norfolk Street, London, W.C.2.

Brochure (CM/1) describing the "Callmaster" five-way intercommunication equipment.—**P. & R. Electrical (London), Ltd.**, 1, Berrymead Gardens, Acton, London, W.3.

WIRING ACCESSORIES. — Illustrated folder covering the company's 13 A socket-outlets, plugs, and boxes to B.S.1363.—**Midland Electric Manufacturing Co., Ltd.**, Reddings Lane, Tyseley, Birmingham, 11.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 6th September:—

GRUNDIG (design). No. 763,885. Class 9. Radio and television apparatus and instruments; apparatus for recording and reproducing sound, and apparatus for recording data, all using magnetic material as the recording and reproducing medium; electronic measuring apparatus and instruments; and parts. LUMOPHON (design). No. 774,475. Class 9. Radio apparatus, television receiving apparatus, television cameras, sound recording and reproducing apparatus and instruments, and parts.—Grundig Radio-Werke G.m.b.H., Furth, Bavaria, Germany. Address for service, c/o A. A. Thornton & Co., 24-27, High Holborn, London, W.C.1.

ELECTRODELCA. No. 772,810. Class 9. Optical instruments, photographic cameras and cinematographic cameras, all incorporating electric or electronic apparatus; television cameras; cathode ray tubes incorporating devices for increasing the brightness of the image produced; and parts.—N.V. Optische Industrie "De Oude Delft," Delft, Netherlands. Address for service, c/o Jensen & Son, 77, Chancery Lane, London, W.C.2.

PYNFORD. No. 775,613. Class 9. Apparatus for measuring or indicating levels or pressures and for automatically controlling the operation of contrivances in accordance with the levels or pressures so measured or indicated; electrical follow-up apparatus; and valves automatically operated by electric current control, or by pressure, or by other changes in physical conditions.—Pynford, Ltd., 74, Lancaster Road, Stroud Green, London, N.4.

MAGI MASTER. No. 776,642. Class 9. Vacuum cleaners (electric) and apparatus for recording and reproducing sound by means of magnetic tape.—Magi Master, Ltd., 8-10, Lyons Place, London, N.W.8.

LINTRAN. No. 776,672. Class 9. Electrical apparatus and instruments.—James Scott & Co. (Electrical Engineers), Ltd., 27, Cadogan Street, Glasgow, C.2.

CORONETTE. No. 777,109. Class 10. Hearing aids for the deaf, and parts.—Multitone Electric Co., Ltd., 12-20, Underwood Street, London, N.1.

TERRALUX. No. 772,808. Class 11. Lamp shades, bowls, globes and like lamp enclosures for domestic, office, factory and street lighting.—Holophane, Ltd., Elverton Street, Vincent Square, London, S.W.1.

SOLEC. No. 775,754. Class 11. Electrically heated drying cabinets.—H. N. Southorn (Engineers), Ltd., Solec Works, Church Lane, West Bromwich, Staffs.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1947

6494. Sylvania Electric Products, Inc.—Wire-forming and coiling machines. 7th March, 1947. (800690.)

1952

980. Scott, A. Bodley-, and Buckingham, J.—Electromagnetic apparatus for the determination of mechanical stresses or movements. 12th January, 1953. (800504.)

1953

35203. Siemens Edison Swan, Ltd.—Manufacture of lengths of synthetic plastic material. 8th December, 1954. (800451.)

1954

2841. General Electric Co., Ltd., and Ramsay, D. A.—Magnetic amplifiers. 29th April, 1955. (800594.)

9006. Simplex Electric Co., Ltd.—Combined electrical switchgear and fuse assemblies. 28th March, 1955. (800364.)

9007. Simplex Electric Co., Ltd.—Electrical switchgear. 28th March, 1954. (800365.)

11777. Nobrac Carbon, Ltd.—Electrical contact elements. 6th June, 1955. (800551.)

22239. Simplex Electric Co., Ltd.—Contact arrangements for electrical switchgear. 20th July, 1955. (800366.)

30465. English Electric Co., Ltd.—Electrical modulator circuits. 21st October, 1955. (800552.)

33620. Marryat & Place, Ltd.—Electrical busbar systems. 17th February, 1956. (800573.)

35275. General Electric Co.—Turbine blade assemblies. 6th December, 1954. (800569.)

35678. Philips Electrical Industries, Ltd.—Semi-conductor devices. 9th December, 1954. (800574.)

36915. Schneider, J. (trading as Schneider & Co. Dr.Ing).—Fittings and mountings for electric lamps. 21st December, 1954. (800553.)

37271. Sylvania Electric Products, Inc.—Electroluminescent lamps. 23rd December, 1954. (800425.)

1955

7918. International Business Machines Corporation.—Electronic data processing machine. 18th March, 1955. (800505.)

9653. Raytheon Manufacturing Co.—Systems for relaying and transmitting television programmes. 1st April, 1955. (800305.)

9976. Carpenter, R. E. H.—Electric tachometers for operation from the ignition systems of internal combustion engines. 23rd March, 1956. (800531.)

11084. Igranic Electric Co., Ltd.—Resistor units. 18th April, 1955. (800454.)

12326. General Electric Co., Ltd., and Ramsay, D. A.—Magnetic amplifiers. 29th April, 1955. (Divided out of 800594.) (800595.)

12385. Nicholson, C. H., and Duke, G. E.—Apparatus for the protection and testing of electrical earth connections. 30th April, 1956. (Cognate application 26395, 15th September, 1955.) (800605.)

13003. General Electric Co., Ltd.—Electric circuit arrangements for operating low pressure electric discharge lamps and incorporating starting means for the lamps. 4th May, 1956. (800532.)

13885. Patelhold Patentverwertungs- & Elektro-Holding Akt.-Ges.—Electric discharge devices. 13th May, 1955. (800347.)

14618. Amp, Inc., formerly Aircraft-Marine Products, Inc.—Electrical connections and methods and means for making same. 20th May, 1955. (800404.)

16798. General Electric Co., Ltd.—Control systems for electric motors. 6th June, 1956. (Cognate applications 22302, 3rd August, 1955, and 34622, 2nd December, 1955.) (800407.)

18348. Standard Telephones & Cables, Ltd.—Electric soldering irons. 22nd June, 1956. (800662.)

19687. General Electric Co., Ltd.—Mounting arrangements for electrical equipment. 20th June, 1956. (800352.)

20782. British Insulated Callender's Cables, Ltd.—Supporting overhead conductors for electric railways. 17th July, 1956. (800575.)

23631. Brill, E. C.—Apparatus for measuring or sensing electrical power, particularly for overload protection. 16th August, 1955. (800535.)

25165. Thorn Electrical Industries, Ltd.—Lanterns for housing electric lamps. 28th August, 1956. (800323.)

28926. Philips Electrical Industries, Ltd.—Radiation apparatus. 11th October, 1955. (800663.)

29326. Rank Cintel, Ltd., formerly Cinema-Television, Ltd.—Methods of glass working, especially for cathode-ray tubes. 12th October, 1956. (800664.)

30043. Song & Co., Ltd., V. K.—Switches for electric torches. 15th October, 1956. (800434.)

32020. Marconi's Wireless Telegraph Co., Ltd.—Cathode-ray tube display devices. 5th July, 1956. (800653.)

33718. Victor Adding Machine Co.—Voltage to pulse number convertor. 24th November, 1955. (800496.)

33814. Standard Telephones & Cables, Ltd.—Pulse current limiters. 25th November, 1955. (800412.)

34183. Foxboro Co.—Electric transformer. 29th November, 1955. (800353.)

34253. Siemens & Halske Akt.-Ges.—Multi-range electrical meters. 30th November, 1955. (800655.)

35740. Western Electric Co., Inc.—Velocity modulation tubes. 13th December, 1955. (800580.)

37327. Nederlanden Staat der, Director General of Postal & Telecommunications.—Apparatus for automatically determining at a distance the largest distortion of telegraph signals in a start-stop code transmitted by a subscriber's station. 29th December, 1955. (800308.)

1956

1246. British Thomson-Houston Co., Ltd.—Miniature electric incandescent lamps. 11th January, 1957. (800350.)

2501. General Electric Co., Ltd.—Electroluminescent devices. 25th January, 1957. (Addition to 788659.) (800581.)

3533. General Electric Co., Ltd.—Nuclear reactors. 28th January, 1957. (800388.)

4432. Seltorp, J. L.—Electromagnetically actuated fluid control valves. 13th February, 1956. (800356.)

5367. General Electric Co., Ltd.—Rotary electric switches. 21st February, 1957. (800668.)

6157. Ilford, Ltd.—Transistor amplifiers. 27th February, 1957. (800506.)

6471. Metropolitan-Vickers Electrical Co., Ltd.—Driving apparatus for recording tapes. 25th February, 1957. (800439.)

7703. Bendix Aviation Corporation.—Directional antenna control system. 12th March, 1956. (800583.)

8217. Siemens-Schuckertwerke Akt.-Ges.—Methods and devices for the sensing of neutrons. 15th March, 1956. (800636.)

8629. Pritchett & Gold & E.P.S. Co., Ltd.—Electric storage batteries. 12th March, 1957. (800329.)

13589. Barber-Colman Co.—Electrical control apparatus. 2nd May, 1956. (800560.)

13824. Westinghouse Electric International Co.—Electric supply systems. 4th May, 1956. (800331.)

17633. Philips Electrical Industries, Ltd.—Magnetic recorders and reproducers. 7th June, 1956. (800638.)

18761. Companhia Portuguesa Radio Marconi.—Dynamic memory device using electrical pulses. 18th June, 1956. (800587.)

19036. Westinghouse Electric International Co.—Stator cores for dynamo-electric machines. 20th June, 1956. (800613.)

19417. Standard Telephones & Cables, Ltd.—Information display arrangements. 22nd June, 1956. (800357.)

21003. Standard Telephones & Cables, Ltd.—Pulse communication system. 6th July, 1956. (800660.)

23294. Philips Electrical Industries, Ltd.—Subscribers' circuits for telephone exchange systems. 27th July, 1956. (800657.)

23594. Western Electric Co., Inc.—Barrier grid storage tube circuits. 31st July, 1956. (800561.)

24165. Telefunken G.m.b.H.—Very short wave directional aerial systems. 7th August, 1956. (800466.)

24252. Contell, F.—A.c. generating plant. 8th August, 1956. (800485.)

24624. Sperry Rand Corporation.—Electron discharge valves. 10th August, 1956. (800588.)

25221. Standard Telephones & Cables, Ltd.—Colour television receivers. 17th August, 1956. (800641.)

25739. Babcock & Wilcox, Ltd.—Nuclear fuel elements. 23rd August, 1956. (800397.)

26592. Mullard Radio Valve Co., Ltd.—Manufacture of information storage matrices. 30th August, 1956. (800468.)

27813. Bendix Aviation Corporation.—Electricity generator operating by magneto-striction effect. 11th September, 1956. (800342.)

31185. Sperry Rand Corporation.—Logical circuits employing transformers. 12th October, 1956. (800399.)

33498. Standard Telephones & Cables, Ltd.—Signalling system. 2nd November, 1956. (800562.)

35878. Standard Telephones & Cables, Ltd.—High voltage insulator for radio tube sockets. 23rd November, 1956. (800448.)

1957

308. Atomic Energy of Canada, Ltd.—Manufacture of clad nuclear fuel elements. 3rd January, 1957. (800470.)

1331. Compagnie Générale de Télégraphie sans Fil.—Aerials. 14th January, 1957. (800620.)

2433. S.E.A. Soc. d'Electronique et d'Automatisme. — Electrical pulse distributing devices. 23rd January, 1957. (800591.)

5603. Philips Electrical Industries, Ltd.—Circuit arrangements for contrast control in television receivers. 19th February, 1957. (800362.)

5848. Allmanna Svenska Elektriska Aktiebolaget.—Over-voltage protective device. 21st February, 1957. (800363.)

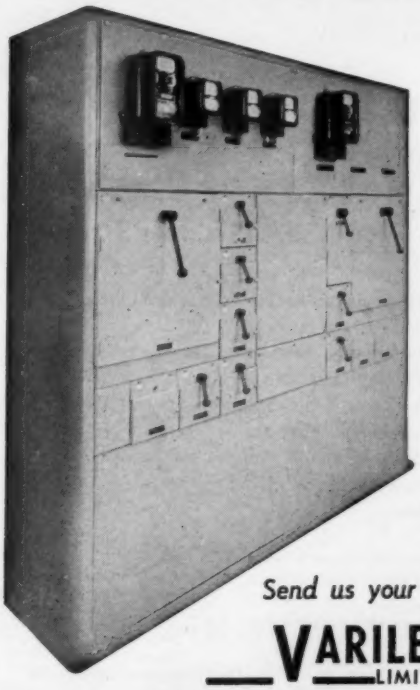
6545. Babcock & Wilcox, Ltd.—Vapour generators and an improved method of generating vapour. 27th February, 1957. (800566.)

11366. National Cash Register Co.—Transistor switching circuits. 8th April, 1957. (800593.)

1958

15330. Siemens Edison Swan, Ltd.—Manufacture of lengths of synthetic plastic material. 8th December, 1954. (Divided out of 800451.) (800452.)

Cubicle Switchboards



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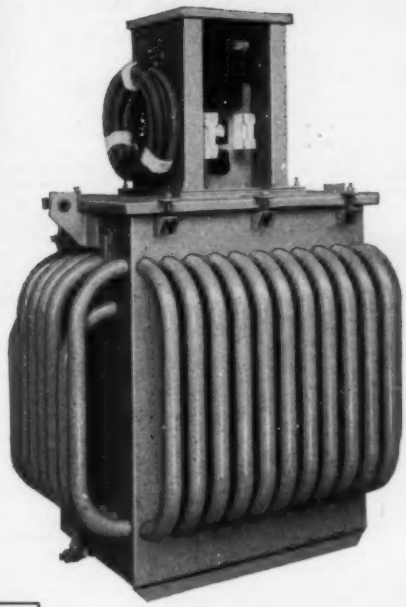

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- ★ Rear wiring, shallow projection, 1ER series.
- ★ Rigid wiring terminals. Calibration unaffected during wiring process.
- ★ Greater consistency.

2½ K.W. 200/250 V. AC only, single pole, single stage Energy Regulator fitted with side wiring terminals. Interchangeable with existing types.

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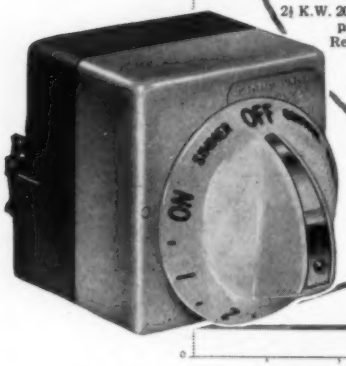

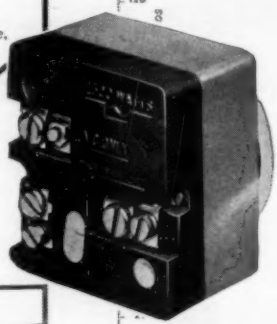

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CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Director of Stores and Contracts, Postmaster - General's Department, Melbourne. 16th October. Lamps, caps and sockets. (E.S.B. 20576/58. Ten/34100.)* 21st October. Coaxial cables and fittings. (E.S.B. 20575/58. Ten/34102.)*

Burma.—Union of Burma Purchase Board, Rangoon. 4th September. Copper wire. (E.S.B. 20523/58. Ten/34080.)* Brass chain and canister starters for fluorescent fittings. (E.S.B. 20525/58. Ten/34081.)* Lighting appliances and fittings. (E.S.B. 20524/58. Ten/34128.)*

Down.—County Health Committee. 12th September. Electrical installation in Holywood Child Health and Welfare Clinic. J. R. W. Murland, consulting engineer, 13, Wellington Place, Belfast.

Formosa.—Central Trust of China, Taipei. 15th September. Power relay test sets. (E.S.B. 20643/58/I.C.A. Ten/34153.)*

India.—Damodar Valley Corporation, Calcutta. 8th September. Transformers. (E.S.B. 20760/58. Ten/34173.)*

Mysore State Electricity Board, Bangalore. 15th September. 11 kV switchgear. (E.S.B. 20538/58. Ten/34141.)*

Neyveli Lignite Corporation (Private), Ltd. 12th September. Nine 2,000 kVA power transformers. (E.S.B. 20537/58. Ten/34140.)*

Iran.—Plan Organisation, Teheran. 9th September. Electrical network at Lahidjan. (E.S.B. 20675/58. Ten/34156.)* 21st September. Telephone cables and associated installation equipment. (E.S.B. 20567/58. Ten/34115.)* 24th September. Electrical network for Soldouze and Naghadeh. (E.S.B. 20460/58. Ten/34094.)*

Ministry of Posts & Telegraphs & Telephones, Teheran. 14th September. Two 100 kW broadcast transmitters and accessory components. (E.S.B. 20421/58. Ten/34095.)*

Llanidloes.—Borough Council. 9th September. Supply and erection of 44 tubular steel lighting columns and wall brackets, complete with 140 W sodium discharge lamps and lanterns on trunk road A.492. Borough surveyor, Town Hall.

London.—India Store Department. 29th September. Four electric cargo lifts for Madras Port Trust. (See this issue.)

New Zealand.—General Post Office, Wellington. 24th September. Radio valves. (E.S.B. 20236/58. Ten/34023.)* 26th September. Crystal holders and sockets. (E.S.B. 20569/58. Ten/34144.)*

Pakistan.—Government Department of Supply and Development, Chittagong. 15th September. Insulated cable and joint boxes. (E.S.B. 20487/58. Ten/34087.)* 16th September. Nickel iron alkaline batteries. (E.S.B. 20488/58. Ten/34098.)* 17th September. Copper wire, insulated cable, aerial fuses, switchgear, meters and porcelain insulators. (E.S.B. 20489/58. Ten/34086.)* 22nd September. Six 200 kVA, two 300 kVA and two 500 kVA transformers. (E.S.B. 20490/58. Ten/34088.)*

South Africa.—Stores Department, South African Railways, Johannesburg. 10th September. Motors and control equipment for cranes. (E.S.B. 20505/58. Ten/34084.)* Telephone switchboards. (E.S.B. 20506/58. Ten/34083.)* 19th September. Electric cable and end boxes. (E.S.B. 20690/58. Ten/34123.)*

Union Tender and Supplies Board, Pretoria. 4th September. Electronic valves (E.S.B. 20984/58. Ten/34242.)* 11th September. Tumbler switches. (E.S.B. 20655/58. Ten/34131.)* 100 transformers (ratings 75 W and 37·5 W). (E.S.B. 20656/58. Ten/34135.)* Copper and bronze sleeves for jointing line wire. (E.S.B. 20654/58. Ten/34134.)* 80 mains operated static ringing convertors. (E.S.B. 20657/58. Ten/34155.)* Receivers. (E.S.B. 20626/58. Ten/34132.)* Protector mountings and strips. (E.S.B. 20627/58. Ten/34139.)* 18th September, Electronic valves. (E.S.B. 20988/58. Ten/34243.)*

Johannesburg Electricity Department. 1st October. 88 kV outdoor switchgear. (E.S.B. 20549/58. Ten/34099.)*

Surbiton.—Borough Council. 5th September. Supply and erection of 96 units for improved street lighting. R. Thirlway, borough engineer, Council Offices, Ewell Road.

Thurrock.—U.D.C. 15th September. Erection of columns and installation of electrical equipment for three group "A" and 128 group "B" street lighting units. Surveyor, Council Offices, Palmers Avenue, Grays.

Uruguay.—Direccion General de Comunicaciones (Services de Transmisiones). 18th September. Radiotelegraph transmitter. (E.S.B. 20279/58. Ten/34059.)*

Yorkshire.—North Riding County Council. 22nd September. Street lighting equipment. (See this issue.)

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Fleet.—U.D.C. Recommended. Erection of 92 lamp standards (£3,245).—Revo Electric Co.

Lancashire.—County Council Education Committee. Recommended. Renewal and modernisation of electrical installation at Brierfield Walter Street County School (£1,865). — G. Bracewell. Renewal and modernisation of the electrical installation at Lancaster Greaves County Secondary School (£2,660).—Simpsons (Lancaster).

Highways and Bridges Committee. Lighting of roundabouts and link roads of the Preston by-pass (£11,934).—Revo Electric Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Addiscombe.—Flats (42), Addiscombe Road; Lawdon Partners, Ltd., 157, Victoria Street, London, S.W.1.

Airdrie.—Houses (30), Willow Drive; town clerk, Municipal Buildings.

Barking.—Development of Borough Hospital; H. B. Horner, architect, 4, St. George Street, London, W.1.

Berwick.—Houses (60), Spittal Hall estate; J. A. Armitage, borough engineer.

Birkenhead.—Factory extensions, Corporation Road; Alfred Holt, Ltd., Pierhead, Liverpool.

Birmingham.—Extensions to the pathological laboratory at Little Bromwich Hospital (£47,500); Regional Hospital Board, 10, Augustus Road, Edgbaston, Birmingham, 15.

Bognor Regis.—Home for blind persons, Aldwick House grounds (£31,350); West Sussex county architect, County Hall, Chichester.

Boldon.—Private housing estate at Cleadon; Wimpey & Co., Ltd., builders, Fenwick Terrace, Newcastle-on-Tyne.

Brighton.—Three-storey block, Brighton College, Eastern Road; Clayton, Black & Daviel, architects, 10, Prince Albert Street.

New open market; planning officer, 26/30, King's Road.

Castle Bromwich.—Library, clinic and nurses' flats for Warwickshire C.C.; Thomas Lowe & Sons, Ltd., builders, Curzon Street, Burton-on-Trent.

Coventry.—Extensions to Newlands House (£20,085); A. G. Ling, city architect, Bull Yard.

Croydon.—Slipper baths, Morland Road/Lower Addiscombe Road corner site, and houses (44), Ely/Holmesdale Road and Dagnall Park; E. Taberner, town clerk, Town Hall.

Cumberland.—Extensions to two factories for West Cumberland Industrial Development Co., Ltd., 30, Roper Street, Whitehaven.

Durham.—Additions for F. W. Woolworth and Co., Ltd., Lord Street, Liverpool; own architects.

Additions, Silver Street, for Marks and Spencer, Ltd.; Norman Jones and Rigby, architects, Lord Street, Southport.

East Ham.—Flats (40), Woodman Street; borough engineer.

Exeter.—County hall, to be erected in stages (£865,000); Devon county architect, 97, Heavitree Road, Exeter.

Gainsborough.—Proposed erection of 200 houses; Council's surveyor, Gainsborough, Lincs.

Gloucester.—Factory; Daystrom, Ltd., Essex House, Essex Street, London, W.C.2.

Guildford.—Dwellings (100), Park Barn estate; E. Clarke & Sons, Ltd., builders, Brighton Road, Addlestone.

Office block for Benjamin Heath, Ltd., William Road; C. G. Robertson, Ltd., builders, Ladymead Building Works.

Guisborough.—Fire and ambulance station; C. W. Athey & Son, Ltd., builders, 15, Windsor Road, Middlesbrough.

Harrow.—Extensions to County School for Girls; E. S. Moss, Ltd., builders, 159, Brent Street, London, N.W.4.

Hull.—Additional ward accommodation, General Hospital; Gelder & Kitchen, architects, 120, Alfred Gelder Street.

Ilkeston.—Houses (37), South side of Kirk Hallam estate; A. O. Marshall, borough engineer, Town Hall.

Isle of Man.—Castle Rushden high school (£175,000); Education Authority, Strand Street, Douglas.

Jarrow.—Houses (82), Pearson Place; borough engineer.

Lancashire.—Second portion of Lydiate County Primary School, Lambshear Lane, Ormskirk (£41,400) and new fire station and divisional headquarters at Fulwood (£36,530); county architect, County Offices, Fishergate Hill, Preston.

Lincoln.—Extensions to Usher Art Gallery; R. R. Alexander, city architect, Stamp End.

London.—Extensive additions to B.P. House, Moor Lane, E.C.2; Messrs. Joseph,

[Continued on page 398

WORK IN PROSPECT (*Continued*)

architects, 10, Lowndes Square, London, S.W.1.

Ludlow.—School; Coleman & Tyas, Ltd., builders, Bidford-on-Avon.

Macclesfield.—Bungalows and houses (43), Ivy Road, Weston and Western Avenue; borough architect, 3, Jordangate.

Manchester.—Church of St. Peter, White Moss; Leach, Rhodes & Walker, architects, 90, Deansgate.

Middlesbrough. — Houses (140), near Lodore Grove; E. T. Sweeting & Son, builders, Back Haymore Street.

Department stores, Linthorpe Road, for C. and A. Modes, Ltd.; North & Partners, architects, 40, Broadway, Maidenhead.

Houses (54), Easterside; J. A. Kenyon, borough engineer.

Milford Haven.—Administration buildings for Esso Petrol Refinery; Sir Percy Thomas & Son, architects, 10 Cathedral Road, Cardiff.

Morpeth.—Methodist Church at Scots Gap; J. Dodds & Son, builders, Dark Lane, Morpeth.

North Hykeham. — Secondary modern school; Wm. Wright & Son, Ltd., builders, Park Street, Lincoln.

Norwich.—Out-patient and X-ray accommodation, Norfolk and Norwich Hospital; Edward Boardman & Son, architects, Queen Street.

Nottingham.—Houses and flats (254), Bestwood Park estate; estates surveyor, Guildhall.

Oswestry.—Houses (72), with blocks of two-storey flats, site off College Road; J. E. Taylor, borough engineer, Guildhall.

Oxford.—Congregational Church, Headington; Hector O. Bailey, architect, Midland House, George Street.

Palmers Green.—Flats (30), Hazelwood Lane; New Ideal Homesteads, Ltd., South Street, Epsom.

Pelsall.—Houses and flats (108), Norbury Avenue; James Mason, U.D.C. surveyor, 9, Leighswood Road, Aldridge, Staffs.

Peterborough. — Newark Hill Primary School (£49,764); B. Stokeley, Ltd., Eastfield Road.

Private housing estate at Longthorpe; Milton (Peterborough) Estates, Ltd.

Peterlee. — Houses (218) for Peterlee Development Corporation; Milton Hindle, Ltd., contractors, Fishergate, Preston, Lancashire.

Redditch.—Factory in Beoley Road; George Birch & Co., Russell Street, Willenhall.

Redruth.—Engineering block for Technical College; county architect, County Hall, Truro.

Richmond (Surrey).—Flats (64), Lower Mortlake Road; borough surveyor, Hotham House, Heron Court, Richmond, Surrey.

St. Albans.—Flats (28), as extension of block of shops and flats at Abbotts Avenue West; city engineer, 16, St. Peter's Street.

Salford.—Alterations and modifications at Frederick Road Transport Depot (£100,000); city engineer, Town Hall, 3.

Scarborough.—Eighteen flats at Eastway; H. V. Overfield, borough engineer.

Scunthorpe.—Fire and ambulance station; county architect, Lincoln.

Smethwick.—Flats (119), Uplands site; borough engineer.

Southend-on-Sea.—Factory; Eden Fisher, Ltd., 95/7, Fenchurch Street, London, E.C.3.

South Shields.—Marine and technical college (third stage); Meade Taylor & Wilson, architects, 17, Sheffield Terrace, London, W.8.

Spalding.—Old people's flats (22), Holbeach Road; W. J. Mumford, 16, Cowbit Road, Spalding.

Three-storey flats (24); Fosters & Rudd, Ltd., Grantham.

Spennymoor.—Houses (150) at Middlestone Moor for the U.D.C.; G. H. Gray & Partner, architect, Camden Street, North Shields.

Rebuilding Masonic Hall, Dundas Street; T. White, architect, 1, Tynedale Terrace, Benton, Newcastle-on-Tyne.

Stanley (Co. Durham).—Houses (70) at Wesley Terrace for the U.D.C.; direct labour.

Staveley.—Houses (80), Inkersall Green; U.D.C. surveyor, Lowgates, Staveley, near Chesterfield.

Stockton-on-Tees. — Municipal offices (£198,000); borough architect, 28, The Square.

Stratford-on-Avon.—Workshops and offices, Western Road; Fountain Press, Ltd., 12, Meer Street.

Sunderland.—Houses (76), Howick Street; L. W. Evans, Ltd., contractors, Norfolk Street.

Houses at High Barnes estate for C. Harrison, builder, 74, Toward Road.

Swansea.—Factory; Pressed Steel Co., Ltd., Garsington, Oxford.

Houses (54), Nicander Parade, Mayhill; borough architect, The Guildhall.

Tyrone. — County Education Committee. 17th September. Electrical installation in Aughnacloy Secondary Intermediate School and meals kitchen. J. McCandless, consulting engineer, 6, Murray Street, Belfast.

Warwick.—Large scheme of improvements to engineering services at Central Hospital, Hatton (£194,500); Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston, Birmingham, 15.

Whetstone.—Shops and offices, High Road and Totteridge Lane; E. J. & P. Bower, Ltd., 9, Great North Road, Barnet.

Wilton.—Borough Council. 15th September. Supply and erection of 19 class "B" street lighting columns, together with 900 yd of underground cable. J. W. Armstrong, borough surveyor, Municipal Offices, Kingsbury Square.

Wolverhampton.—Houses (81), Willenhall Road South Estate; borough engineer, Town Hall.

FORTHCOMING EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Thursday, 17th July, to Thursday, 27th September

CARDIFF.—Cardiff Castle. *Daily Telegraph* "Son et Lumière."

Thursday, 31st July, to Saturday, 11th October

GREENWICH.—"Son et Lumière." Presented for the Ministry of Works by Atlas Lighting, Ltd.

Wednesday, 27th August, to Wednesday, 3rd September

GLASGOW.—British Association for the Advancement of Science. Annual meeting.

Wednesday, 27th August, to Saturday, 6th September

LONDON.—Earls Court. National Radio and Television Exhibition.

Monday, 1st September

ILFORD.—Angel Hotel, 8 p.m. A.S.E.E. North East London Branch. "Safety and the Supervisor," by H. E. M. Thomas.

SHEFFIELD.—Royal Victoria Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. Chairman's address, by W. Lewis.

Tuesday, 2nd September

LONDON.—Windsor Castle Hotel, 134, King Street, Hammersmith, W.6, 7.30 p.m. A.S.E.E. West London Branch. "Electric Furnaces," by R. Whittaker.

Tuesday, 2nd September, to Thursday, 11th September

LONDON.—Olympia. Domestic Equipment Trades Fair.

Wednesday, 3rd September

HALIFAX.—Crown Hotel, Horton Street, 7.45 p.m. A.S.E.E. Halifax Branch. 1957 Exhibition Film, introduced by P. A. Thorogood.

LONDON.—Town Hall, Wood Green, N.22, 7.45 p.m. A.S.E.E. North London Branch. "Manufacture and Uses of Mineral Insulated Cables," by H. W. M. Barker.

MANCHESTER. — Engineers' Club, Albert Square, 7 p.m. A.S.E.E. Manchester Branch. "Live Wire Discussions."

PRESTON. — R.A.F.A. Club, East View, 7.30 p.m. A.S.E.E. Preston Branch. "The Electrical Contractor in Industry," by S. Carwin.

Thursday, 4th September

SOUTHAMPTON.—Polygon Hotel, 8 p.m. A.S.E.E. Southampton Branch. Film: "120,000 kW Under the Sea."

Friday, 5th September

BRISTOL.—Grand Hotel, 8 p.m. A.S.E.E. Bristol and West of England Branch. Chairman's address, with talk on "Joint Boiler-House District Heating," by F. C. Cummins.

LIVERPOOL. — M.A.N.W.E.B., Paradise Street, 7.30 p.m. A.S.E.E. Liverpool and District Branch. Chairman's address, by J. S. Buck.

Saturday, 6th September

LEEDS.—A.S.E.E. Leeds Branch. Visit to Rothwell Colliery.

Tuesday, 16th September, to Friday, 19th September

HARROGATE.—Association of Public Lighting Engineers. Annual conference.

Monday, 22nd September, to Friday, 26th September

BIRMINGHAM.—Institute of Metals. Golden Jubilee Autumn Meeting.

Monday, 22nd September, to Saturday, 27th September

MANCHESTER.—City Hall. National Business Efficiency Exhibition.

Tuesday, 23rd September

LONDON.—Caxton Hall. A.S.E.E. Electrical Engineers Exhibition. Ballot meeting.

Wednesday, 24th September, to Friday, 3rd October

LONDON.—Olympia. Industrial Fuel Efficiency Exhibition.

Thursday, 25th September

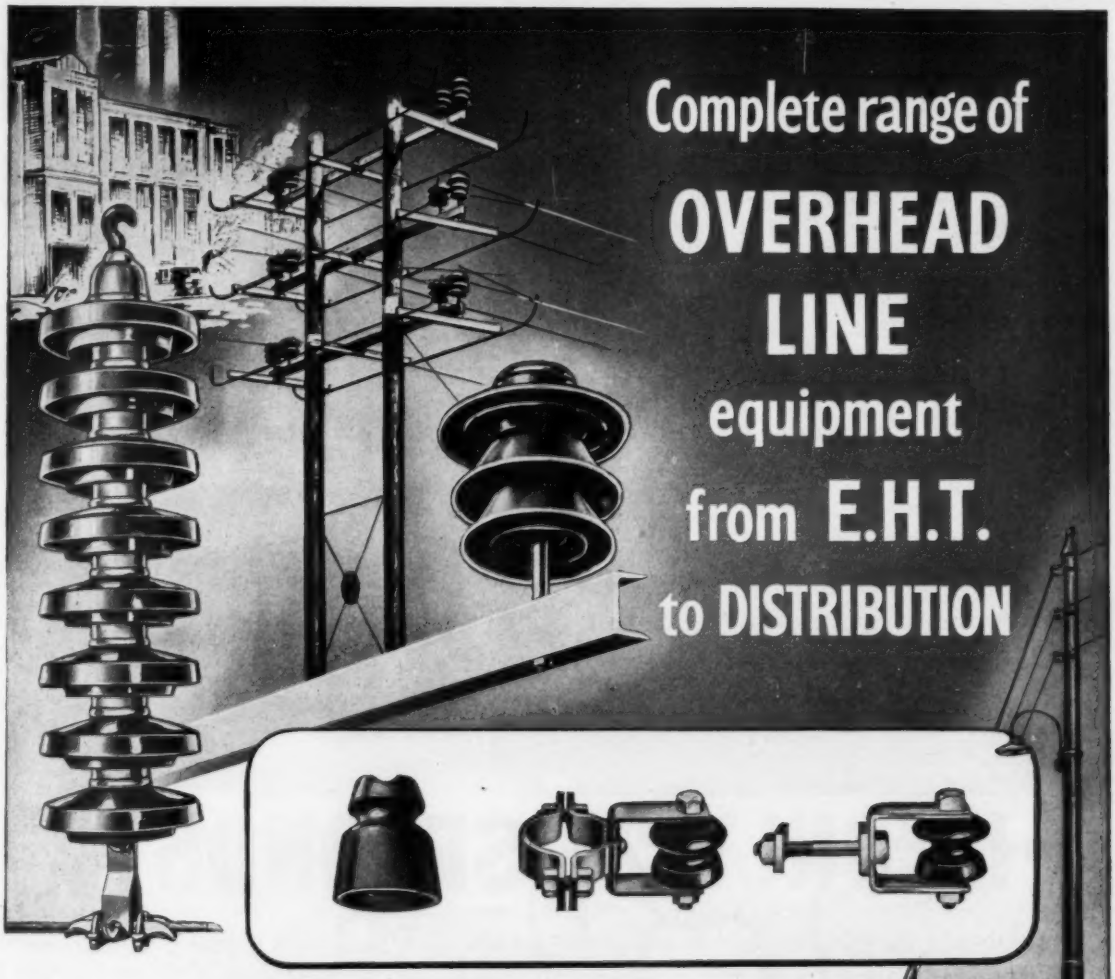
LONDON.—Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. Guest speaker Mr. W. Laver.

Friday, 26th September, to Saturday, 4th October

LONDON.—Earls Court. Commercial Motor Show.

Monday, 29th September

VIRGINIA WATER. — Wentworth Golf Course. Electrical Industries National Golf Championship finals, followed by the annual dinner (7.30 for 8.30 p.m.) at the Park Lane Hotel, Piccadilly, W.



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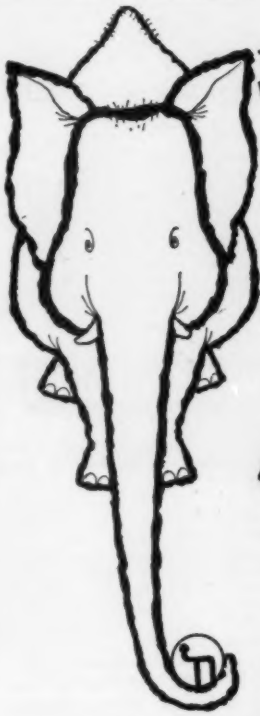

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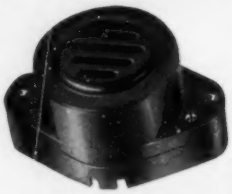

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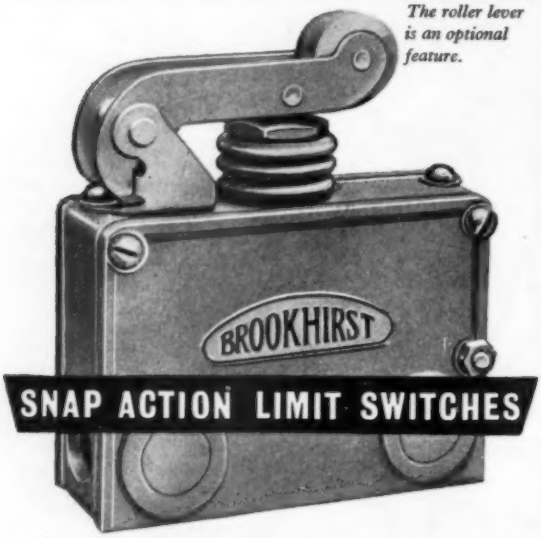

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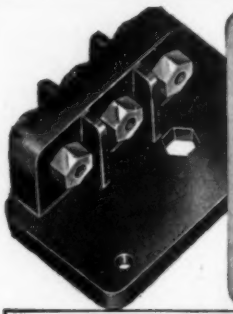

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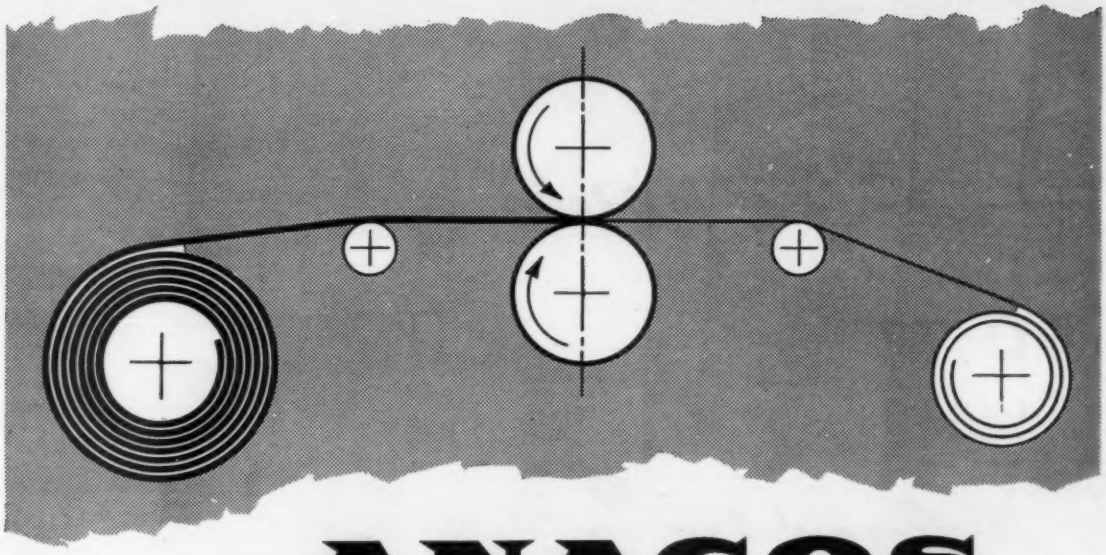

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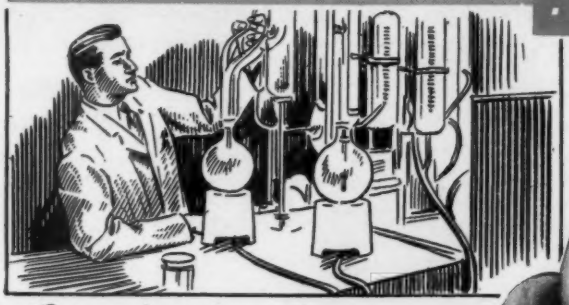

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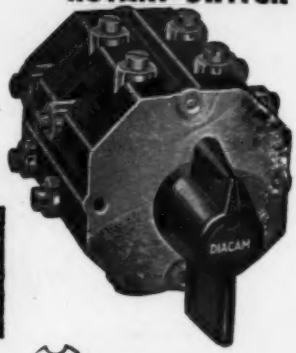
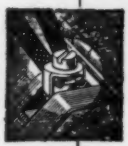


This shows the patent terminal clamp securing two conductors



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The specially engraved identity discs, also panel mounting indicator plates, can be supplied to customers' requirements

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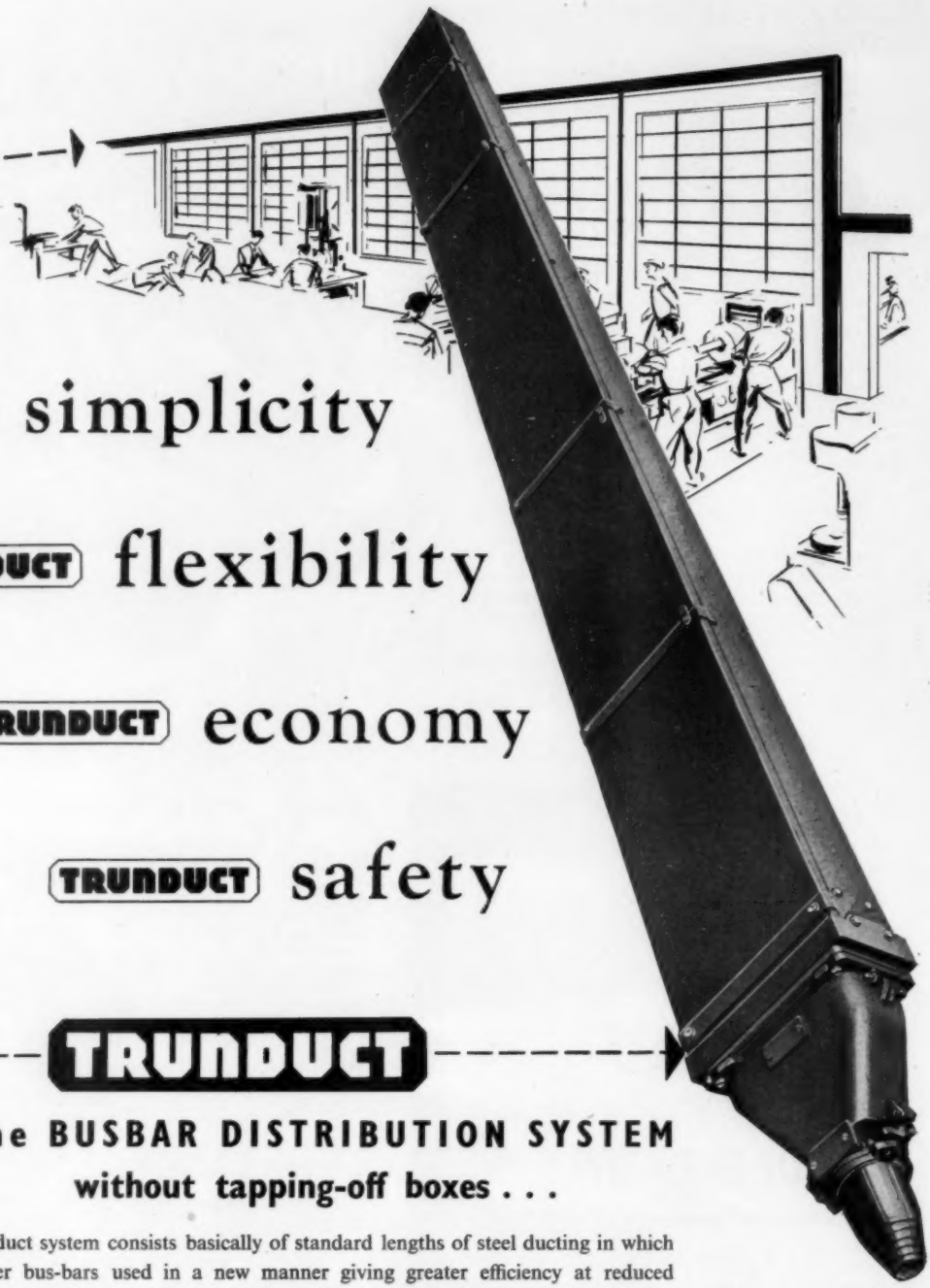

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★ *These are only a few of the advantages of using TRUNDUCT. There are many more! May we send you our fully illustrated folder with prices?*

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CVS—23

'Tis distance lends enchantment to the view,
And robes the mountain in its azure hue.
(Pleasures of Hope by Thomas Campbell)

By courtesy of Tourist Information Centre, Belfast

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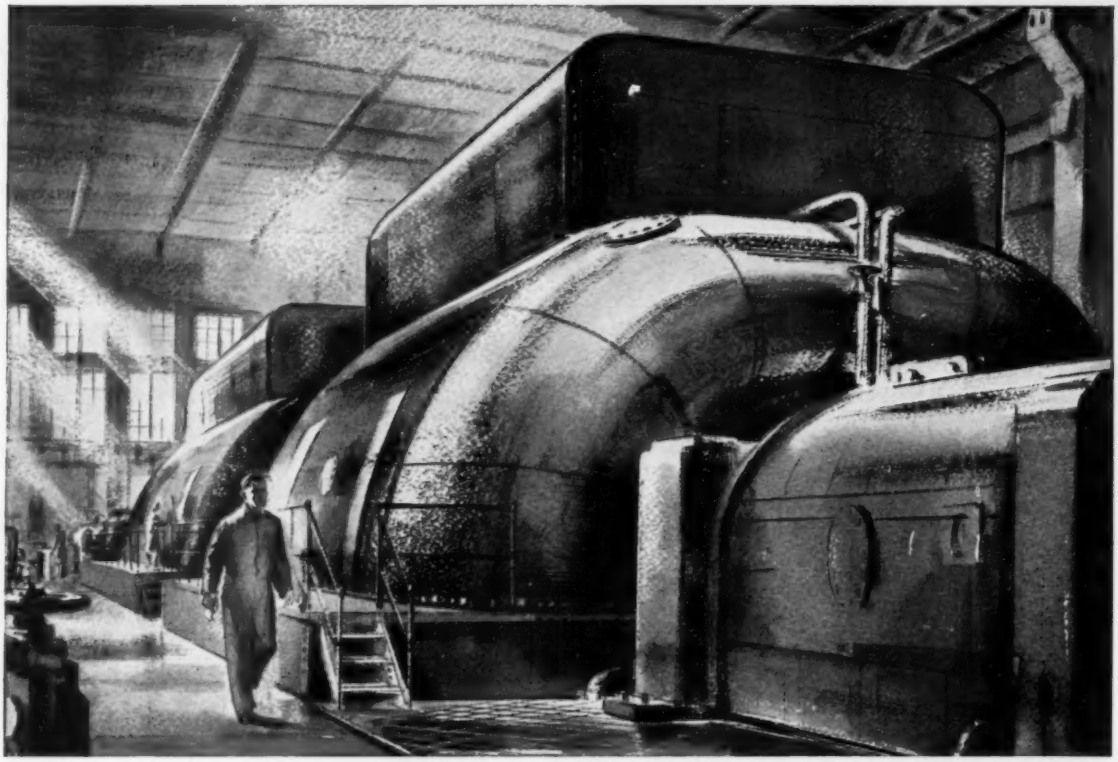
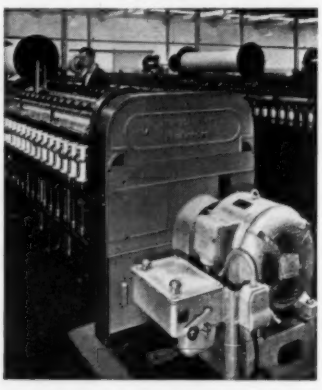


The world's largest Generators will help to fill the demand for still more power

Progress in the development of nuclear energy for generating electricity is still making front-page news —and rightly so. Spectacular advances are continually being made. Less publicised, though in their own field no less outstanding, are recent developments in the design of "conventional" generating plant. The turbo-alternator illustrated, for instance, is a 550,000 kilowatt unit—twice the capacity of the next largest generator now on order for the Central Electricity Generating Board. This machine has been designed for the projected new power station at Thorpe Marsh. For Blythe 'B', another new station, 275,000 kilowatt in-line units are on order. These sets will be served by unit boilers and will operate at steam conditions of 2350 lb. per sq. in. and 1050°F, with reheat to 1000°F.

Nuclear power stations will play an increasingly important part in meeting the doubled demand for electricity forecast for the next ten years. Construction work is progressing rapidly at the sites of the Board's first three nuclear power stations, at Bradwell, Berkeley and Hinkley Point. The aggregate capacity of these stations will be not less than 1,100,000 kilowatts; and by 1966/7 some 5 to 6 million kilowatts of nuclear-generated electric power will be available.



Though these are projects which will not be completed for some time, the work of the Central Electricity Generating Board is playing an important part in today's fight against inflation. Power stations are being built now at an overall cost no greater than in 1948—£50 per kilowatt installed. And, although the output capacity of the industry has doubled since 1948, the increase in manpower is only about one-third.

By providing today for the power we shall need in years to come, the Central Electricity Generating Board is building a secure foundation for our future prosperity.

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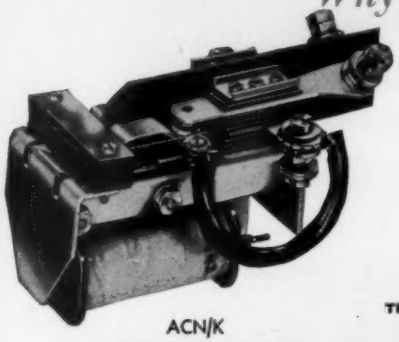

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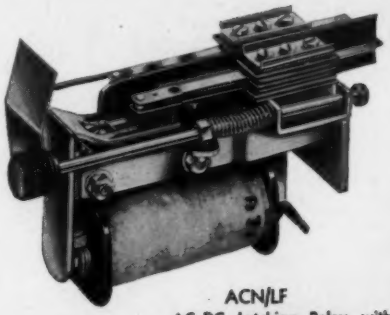

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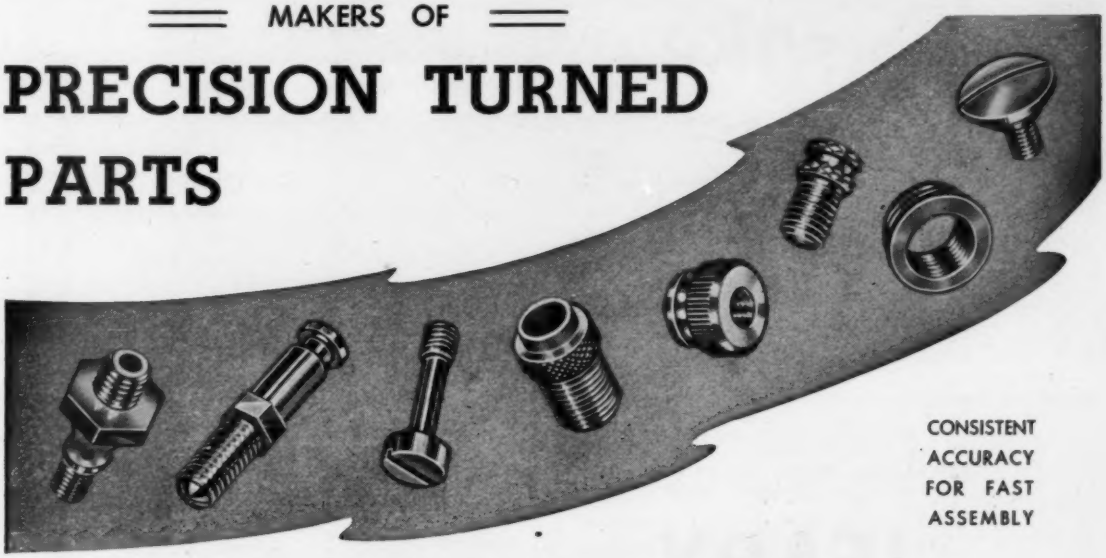

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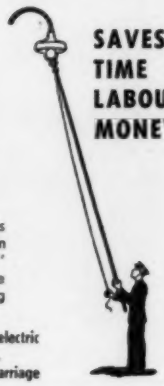

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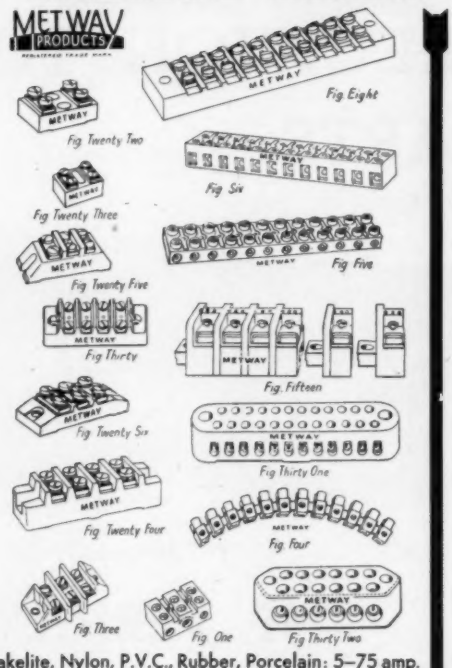

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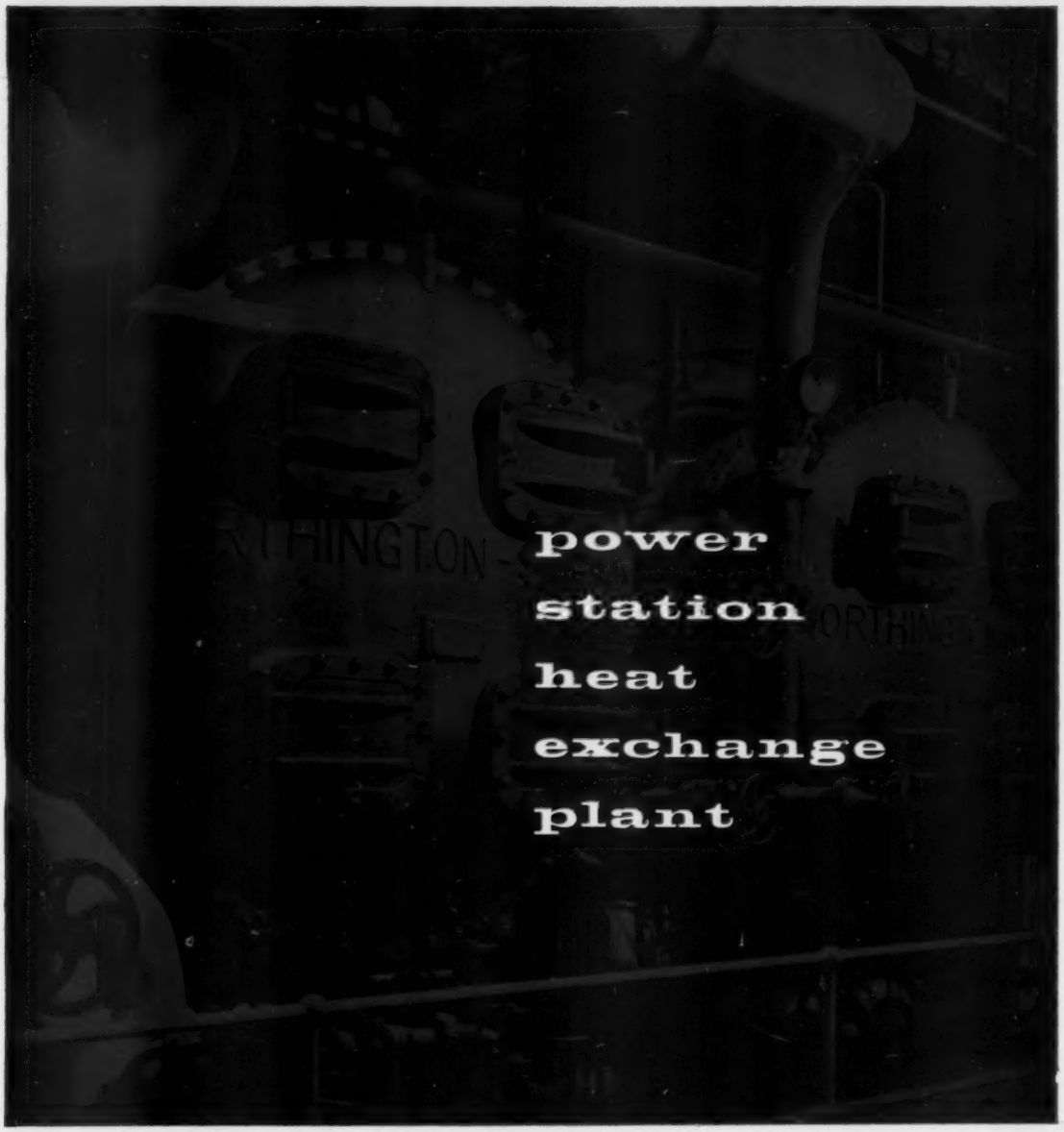

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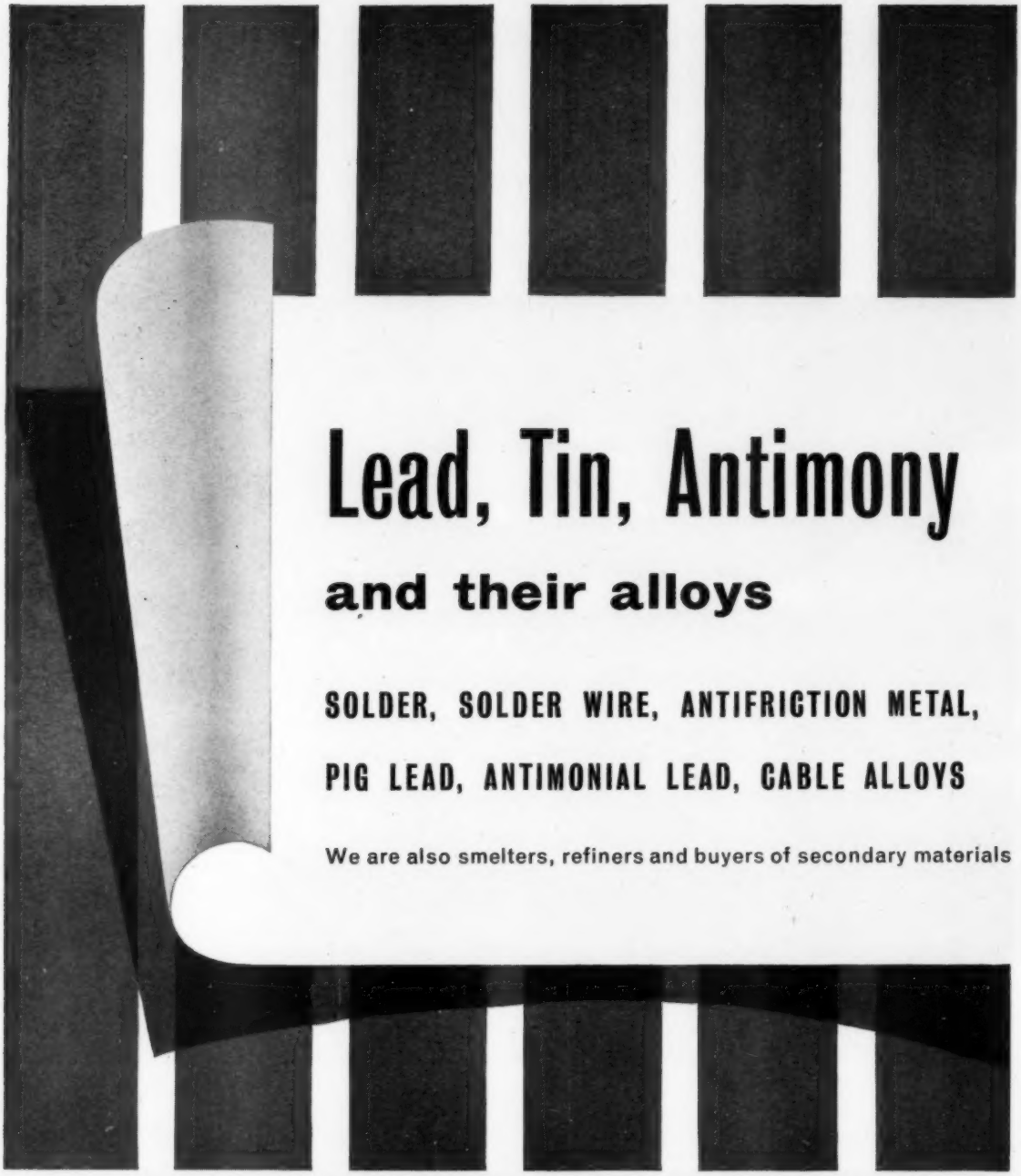

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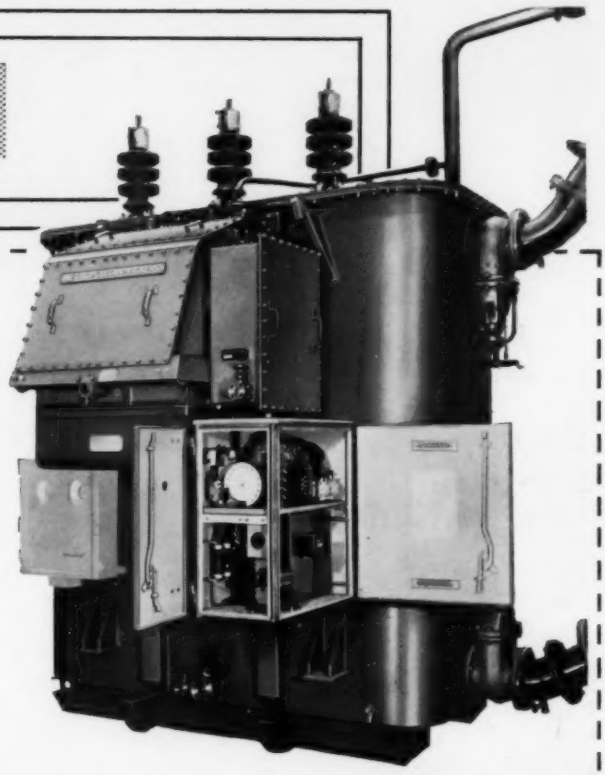
On-load Tap Changers

TYPE M



Designed for use on transformers of up to 275 kV, the Type M tap changer has a simple and reliable operating mechanism which ensures completion of tap change. Transition resistors—liberally rated and mechanically robust—minimize arcing and burning at the contacts of the diverter switches, and ease the switching duty. The complete tap changer with its motor driving gear is compactly assembled as a single, iron-clad unit and bolted to a flange on the transformer tank.

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- *Once initiated, a tap change cannot be interrupted*
- *Continuity of supply maintained during a tap change*
- *Separate drop-down tank allows convenient inspection of diverter switches*
- *Diverter switches are rapid in operation*
- *Contact bounce at diverter switches eliminated*
- *Minimum voltage variation during a tap change*
- *Moving contacts have single bolt fixing and are accessible from the front.*

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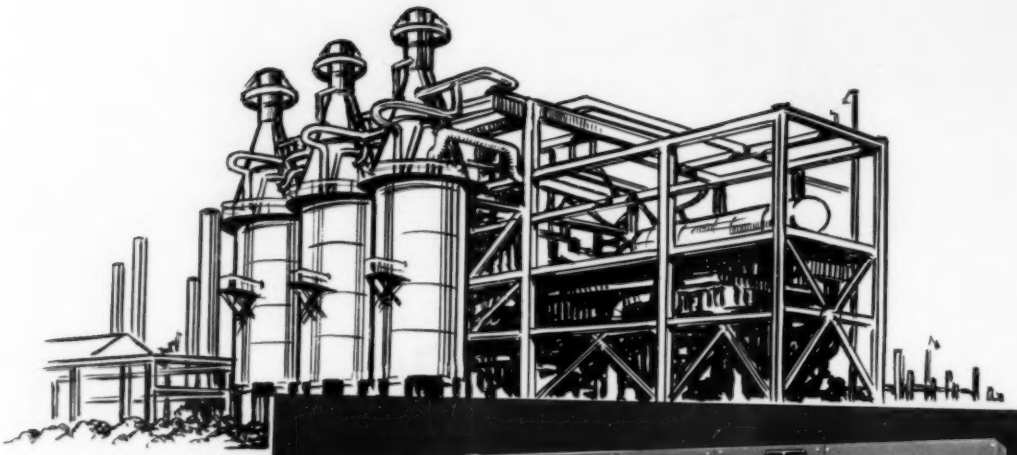

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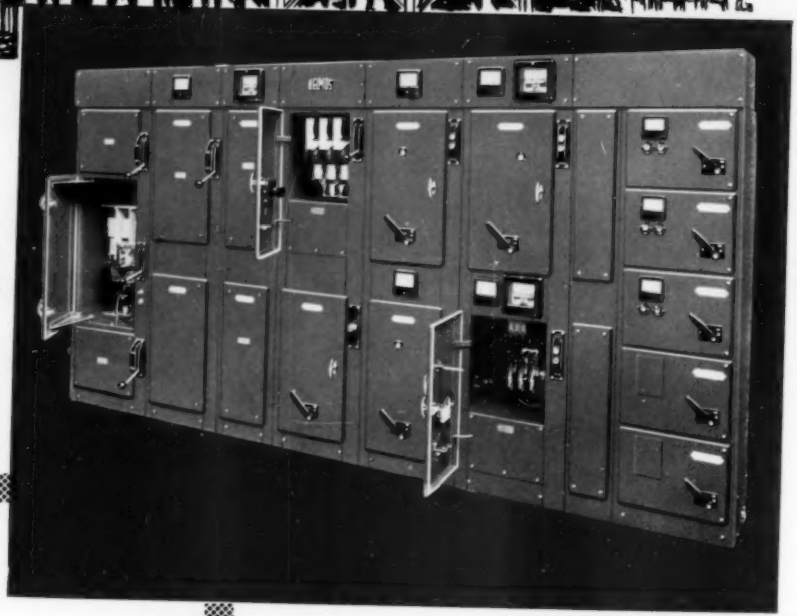

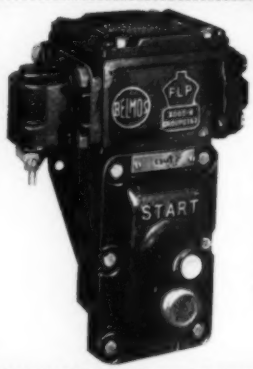

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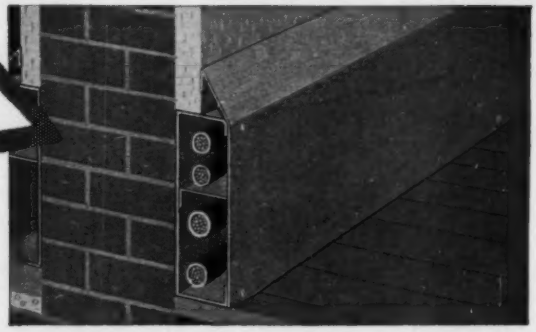

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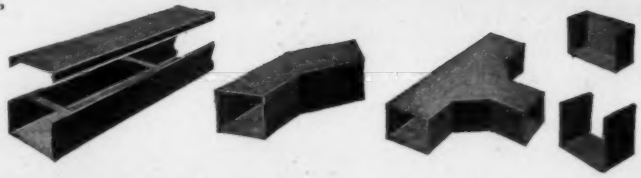

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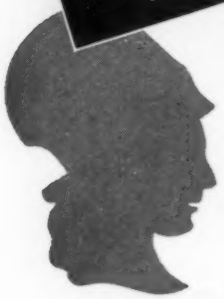

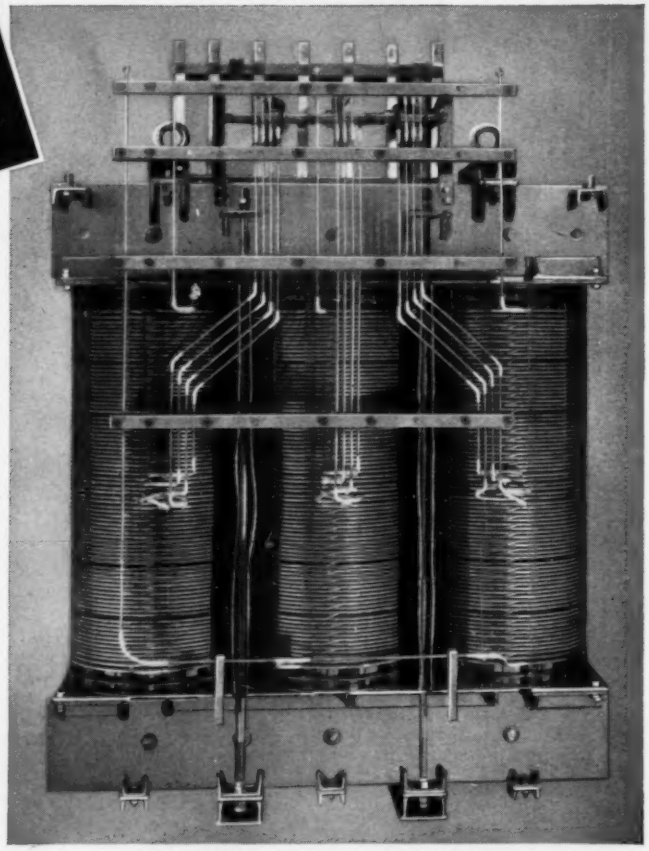

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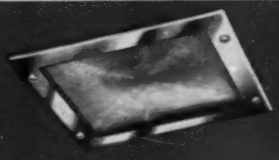

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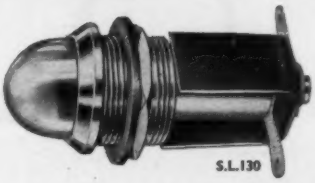

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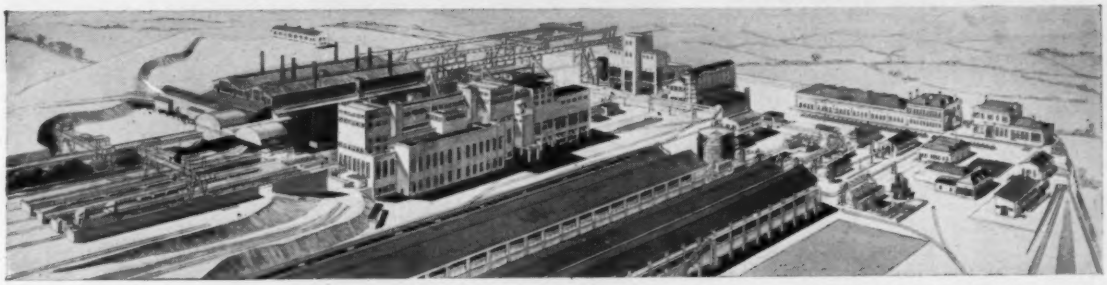
Phone: Northern 5631/2 *Telegrams: "Insulation, Phone, Birmingham"*

Medium Voltage Switchboard with "GEO" Circuit Breakers in the Retort Sub-station.

20 amp Direct-to-line Starter and Feeder Circuit Breaker with integral isolator and complete interlock.

For the new

Provan Gas Works . . .



Perspective Drawing by courtesy of the Main Contractors, Woodall Duckham Construction Co. Ltd.

Ellison Switchgear

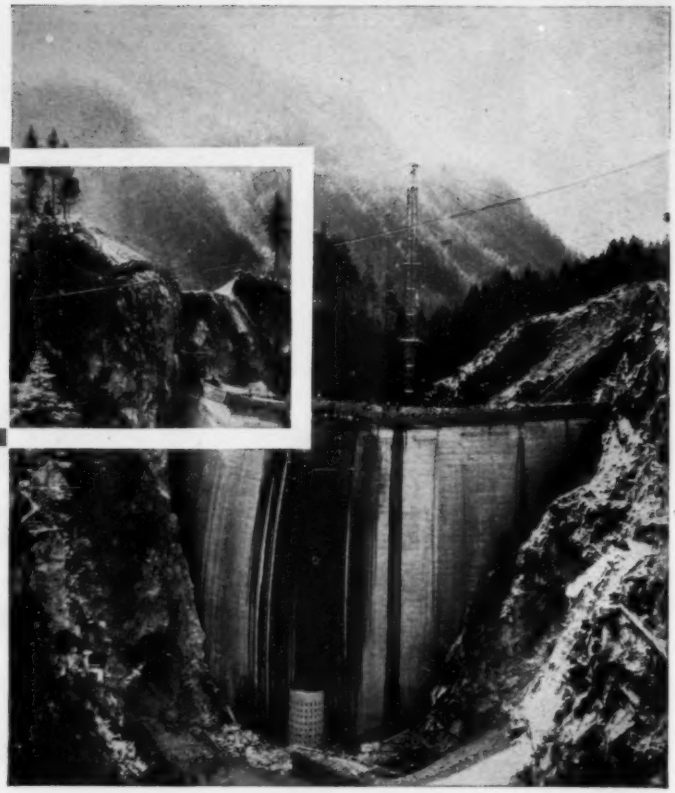
In the reconstructed Provan Works at Glasgow, the Scottish Gas Board has made extensive use of Ellison Switchgear. Some of the equipment is illustrated here. It includes four distribution switchboards as well as many circuit breakers and motor starters.

Rotor Starter for slip-ring induction motors. Available for motors of up to 1000 h.p.

GEORGE ELLISON LIMITED BIRMINGHAM ENGLAND

Continuing a Tradition

Rawlbolts hold a mountain face!



Write now for free Technical Literature and illustrated Charts.

This photograph is a challenge to your imagination. It was taken in the Dolomites in Italy. The fractured mountain face on the left threatened to collapse. It is now held in safety — with *Rawlbolts*. How was it done?

12 tons per Rawlbolt

The whole area shown in the square was supported by K20 Rawlbolts, with high grade tensile steel rods, embedded into the rock to a depth of 66 feet. The Rawlbolts were so spaced as to take a constant load of 12 tons each. It is this standard of performance that accounts for the vast numbers of Rawlbolts used throughout industry every year.

It's the world's speediest bolt-fixing

A Rawlbolt is fixed in minutes — no chiselling, no subsequent grouting in, no waiting for cement to harden. You drill the material, insert the Rawlbolt, tighten up. It is ready to take its full load, *at once*.

RAWLBOLTS

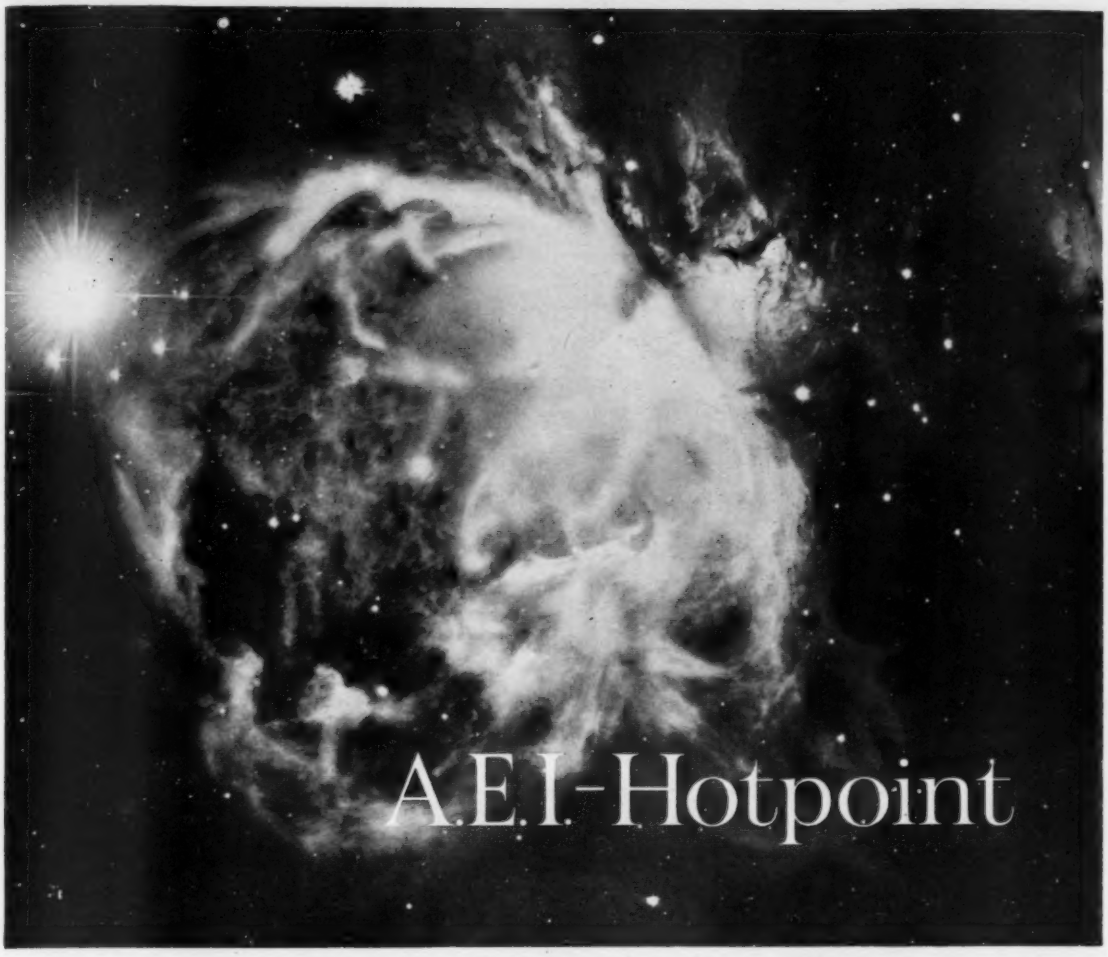
For speed and strength

THE RAWLPLUG COMPANY LIMITED
CROMWELL ROAD · LONDON · S.W.7

8579

RAWLPLUG

The World's largest Manufacturers of Fixing Devices.



A section of the nebula in Orion—graphic reminder of the measureless energy in our universe

Three letters show the world of power behind a well-known name

To-day there is a new name in industry. It is A.E.I.—Hotpoint. It emphasises the close association between Hotpoint and the parent company—Associated Electrical Industries. This association has existed for many years and it has a real significance—namely, that the power of scientific development is not remote. It shows it as a useful part of our lives.

A.E.I. is the biggest manufacturer of the equipment used in the creation, distribution and control of electrical energy in the United Kingdom and the Commonwealth. A.E.I. marshals the resources of more than 70 factories concerned with power in all its forms: fission power, thermal power, and the encouraging work on the harnessing of H-power. A.E.I. is vast, resourceful—almost beyond our imagination.

But Hotpoint we know. Hotpoint make things for our homes: washing machines, refrigerators, heaters, kettles, irons. And they make them well. Each product has earned its own respect. The respect that excellence of materials, craftsmanship and performance always brings.

Link these two organisations together and the new name is there. A.E.I.—Hotpoint. The name that stands for power peacefully used, the basis of our future well-being.

A.E.I.-Hotpoint Limited CROWN HOUSE, ALDWYCH, LONDON W.C.2

HIGH CYCLE for HIGH SPEEDS

Macfarlane produce a range of 200 cycle alternators for High Frequency Power. These are most generally supplied to users of high cycle portable power tools, but they have many applications in industries where high speed machinery is used. Fuller information on request.

MACFARLANE ALTERNATORS

THE MACFARLANE ENGINEERING CO. LTD.
Netherlee Road, Cathcart, Glasgow, S.4. Tel. : Merrylee 2255-7

For Specialised and Personal Service to the Trade & Industry

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Stockists and Distributors of

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and all leading Electrical Products

Write or 'phone for immediate Service:

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If you need

a small **METAL PRESSING** for your product, why not consult us?

We specialise in light precision presswork in all metals for the Electrical Trades.

QUOTATIONS BY RETURN

BIRMINGHAM SPECIALITIES LTD.

80-81 Bath Street, Birmingham 4. *Phone: Central 2492*

SIFAM

The 6-inch rectangular moving coil instrument shown is only one from a wide range of high-grade instruments of all types and sizes, described and illustrated in the Sifam Catalogue.

Write now for Data sheets mentioning your requirements to:—

SIFAM ELECTRICAL INSTRUMENT CO. LTD.
LEIGH COURT, TORQUAY
Telephone 4547/8

Insist on

T.E.C.

POWER AND DISTRIBUTION TRANSFORMERS TO 100 kVA, LOW VOLTAGE FLASH TEST AND RECTIFIER UNITS, METAL WORK, LIGHT ASSEMBLY, SLOTTED ANGLES AND TRANSFORMER & ELECTRICAL REPAIRS

Leaflets on request

LOW VOLTAGE POWER AND LIGHTING UNITS

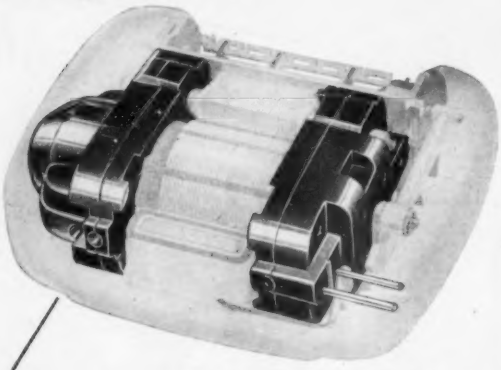
The TRANSFORMER & ELECTRICAL CO. LTD.

HONYWOOD RD., BASILDON, ESSEX

Telephone: Basildon 20491/3

for a most important component

Next to the cutting head the motor which drives it is the most important component in an electric shaver. The mouldings to house the motor are all-important too if a smooth, trouble-free action is to be achieved.

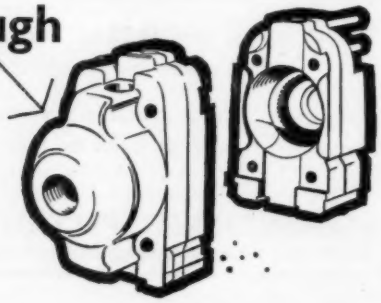


. . . in the world's finest electric shaver

Not easy mouldings—with metal inserts and holes at all angles and particularly the moulded-in bearing insert. Absolute dimensional accuracy and stability, year in, year out, was essential. It posed quite a problem for our tool makers and technicians but few problems are insuperable to us after over 47 years specialised experience in plastic moulding production.

only the best is good enough

For these transfer mouldings which are illustrated by kind permission of Sunbeam Electric Ltd., we selected a thermosetting material. Your enquiries would be welcomed.



Walsall Works (Eldon Street)

Walsall Works (Bescot Crescent)

E. Elliott Limited

the plastic moulders with the engineering background

Cheapside Works

Victoria Works (Summer Lane)

315 Summer Lane, Birmingham 19. Tel: ASTon Cross 1156-7-8-9

SOLDERING COMMUTATORS

AT OVER 500 PER HOUR

(An achievement by one of our customers)

FEATURE FACTS

A compact Commutator Soldering Machine which greatly speeds production and simplifies a tedious process.

FURTHER FACTS

Full technical information regarding your commutator soldering problems will be supplied on request.

Write for further details quoting reference 2N.

Barlow-Whitney LTD

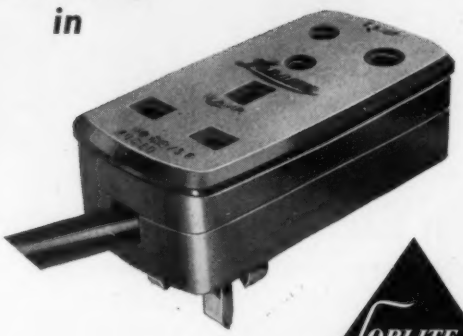
BARLOW-WHITNEY LTD., 2 DORSET SQUARE, LONDON, N.W.1 Tel.: AMBassador 5485 Works: London and Bletchley

BMJ

For the first time

PRINTED CIRCUIT

Reliability in



LOBLITE

Multi-Plug Adaptors

Send TODAY for full particulars to :—

LOBLITE LTD.

Manufacturers of Lighting Fittings and Electrical Accessories

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H

LONDEX

midget relays

Londex midget relays, made to the highest standards, are designed for incorporation in electronic equipment and business machines or in other types of industrial control mechanisms where space and weight are limited.

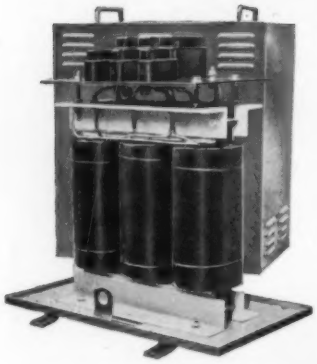
COILS available for A.C. or D.C. working. Continuously rated.

CONTACTS make and break or changeover. Maximum, 3 sets of changeover.

Leaflet No. 123/ER available on request

LONDEX LTD.

Anerley Works, London, S.E.20 Sydenham 3111



Quality Transformers for all purposes in silicon steel, grain oriented steel, "C" cores, "E" cores, "Y" cores to BRITISH STANDARDS SPECIFICATIONS — Chokes — Reactors

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AIR COOLED

TRANSFORMERS

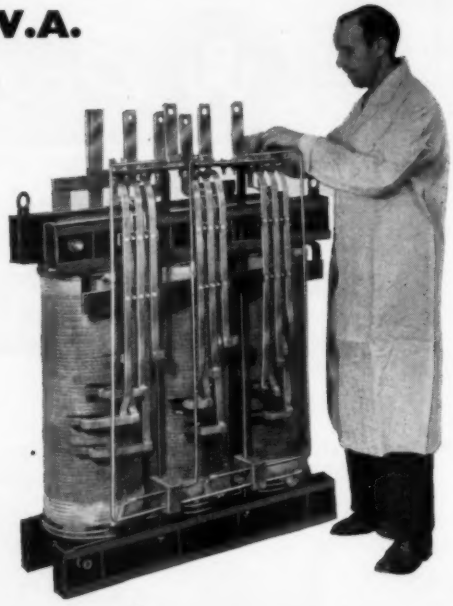
UP TO 500 K.V.A.

Oil Cooled Transformers up to 500 K.V.A. 33 K.V.

Prototype and development work

Repairs to all types of transformers up to 500 K.V.A.

Speedy delivery



Also Manufacturers of

CONTROL PANELS
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FOR SPECIAL PURPOSES
LOW VOLTAGE TRANSFORMERS FOR HAND-TOOLS AND LIGHTING

SUPPLIERS OF TRANSFORMERS FOR HIGH MARNHAM POWER STATION

Approved by C.E.G.B. On Post Office and Ministry of Supply Lists.

EXPRESS

TRANSFORMERS & CONTROLS LTD.

44-46 Beddington Lane, CROYDON, Surrey

Telephone : Thornton Heath 2443-4

Aeroflex

ENERGY LIMITING

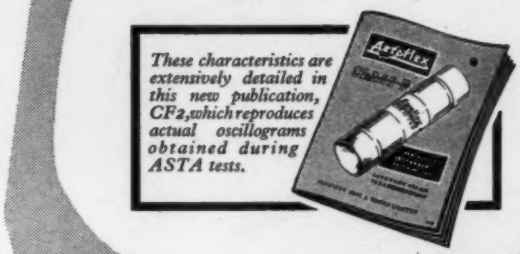
CARTRIDGE FUSES TO CLASS P

This new range of Aeroflex Fuses (AD and FC type) Category 440 AC5 Class P - is fully interchangeable with the former patterns and is now supplied in all listed Fluvent Switch and Fusegear. They offer refinements in performance, primarily due to the following factors:-

TECHNICAL DATA

Publication CF2 deals extensively with the subject and affords interesting data. A copy will be forwarded gladly to enquirers and students.

These characteristics are extensively detailed in this new publication, CF2, which reproduces actual oscillograms obtained during ASTA tests.



(1) The proved Breaking Capacity is raised from 33 to 46 K.A.

(2) The Energy Limiting is uniformly developed throughout the range.

(3) The fusing Factor is standardised at 1.25 throughout the range.

(4) The cartridge cases are ceramic instead of fibre.

(5) The end caps are fixed instead of being detachable as in the AF pattern, and re-wiring is normally carried out by returning blown cartridge fuse-links to the factory and not on site.

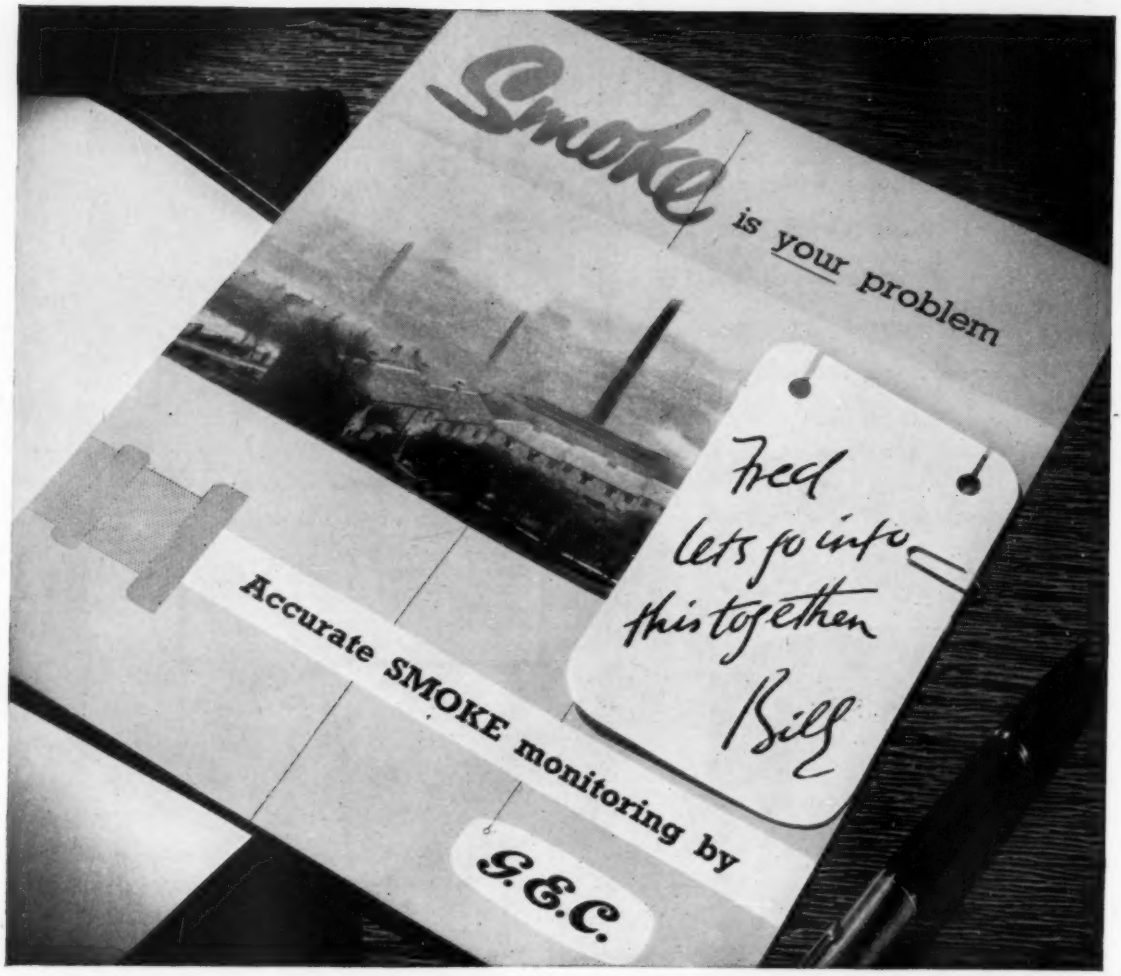
★ *The latest types of Aeroflex fuse element as employed in the AD and FC type Energy Limiting Fuses.*

Rewireability : Fuse Links are not discarded when blown —they can be returned for prompt replacements under our rewiring service scheme.

Parmiter Hope & Sugden Ltd

FLUVENT ELECTRICAL WORKS · LONGSIGHT · MANCHESTER 12

London : 34 Victoria Street, S.W.1. *Glasgow :* 5 Somerset Place, C.3. *Birmingham :* 39/41 Carrs Lane, 4.



Send now for this G.E.C. publication

'Smoke is your problem' (publication No. OV3865) describes—in detail—the G.E.C. Photoelectric Smoke Density Alarm. Designed in the interest of smoke abatement, the alarm gives an immediate and accurate check of the smoke density in a stack.

THE GENERAL ELECTRIC CO. LTD · MAGNET HOUSE · KINGSWAY · LONDON W.C.2

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to First Post on Monday of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

CITY OF CARDIFF

Street Lighting Works

TENDERS are invited severally for the following Street Lighting works:—

1. Supply of 180 Class A Spun Concrete Columns.
2. Supply of 43 Galvanised Prefabricated Brackets for traction poles.
3. Supply of 260 Sodium, 21 Mercury Class A Lanterns and auxiliary gear.
4. Supply of Clockswitches.
5. Erection of 180 Class A Columns,
6. Fixing of Lanterns, Brackets, etc., and wiring through.
7. Removal of obsolete apparatus.

Tenders will be considered for the whole or any portion of the works and the Council does not bind itself to accept the lowest or any tender.

Copies of the form of agreement, conditions of contract and drawings may be inspected at the City Surveyor's Office, City Hall, Cardiff, from whom copies of the specification, bills of quantities and conditions of tender may be obtained upon deposit of £2 2s. for part or £5 5s. for the whole of the works. Cheques should be made payable to Cardiff Corporation General Rate Fund.

Tenders will not be considered unless enclosed in a plain sealed envelope endorsed "Tender for Street Lighting Works," addressed to the undersigned at the City Hall, Cardiff, and delivered by registered post so as to be received not later than the 15th September, 1958.

The envelope must not bear the name of or any mark indicating the identity of the tenderer.

S. TAPPER-JONES,
Town Clerk.

City Hall, Cardiff.
8th August, 1958. 4494

INDIA STORE DEPARTMENT

THE Office of the Chief Engineer, Madras Port Trust, Madras, India, invites tenders for the following:—

Tender Enquiry No. 16/EP3/2000/58, for the supply of 4 Electric Cargo Lifts for "K" Warehouse.

Specifications, drawings, etc., relative to the above can be obtained direct from the Deputy Chief Accounts Officer (Engineering), Chief Engineer's Office, Madras Port Trust, Madras, India, on payment of 15 shillings per set, which is not refundable. Tenders are to be returned direct to the Chief Engineer's Office (at "C" Warehouse), Madras Port Trust, Madras, India, so as to reach them by 3 p.m. on 29th September, 1958.

Specimen copy of the above specification can be seen at India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, under reference S.3593/58/AVH/Eng.2. 4593

NORTH RIDING COUNTY COUNCIL

Lighting on Trunk Roads

LIGHTING contractors wishing to tender for the installation of Mercury Vapour Street Lighting systems at three roundabouts, Dishforth (A.1/A.168), Baldersby Gate (A.1/A.61) and Kirklevington (A.19/B.1264), are invited to apply to the County Surveyor, County Hall, Northallerton, Yorkshire.

The closing date for the receipt of tenders is 22nd September, 1958. 4575

AUTOMATIC VENDING MACHINES (JERSEY) LTD.

NOTICE is hereby given that for the purposes of the proposed reconstruction and dissolution of the above-named company, of Bond Street Chambers, Mulcaster Street, St. Helier, Jersey, C.I., all persons having claims against the company are requested to submit particulars thereof forthwith to the undersigned solicitors, and in default such reconstruction and dissolution will proceed without regard to any claims of which particulars shall not have been submitted.

R. M. GALSWORTHY & CO.

Martins Bank Chambers,
Halkett Place, St. Helier,
Jersey, C.I. 4585

SITUATIONS VACANT

ELECTRICITY AUTHORITY OF CYPRUS

Appointment of Resident Engineer

A RESIDENT MECHANICAL AND ELECTRICAL ENGINEER is required in Cyprus to supervise the installation of mechanical and electrical plant forming an extension to the Electricity Authority's Power Station at Dekhelia. The present extension includes one 14-MW steam turbo-alternator, two 90,000-lb. per hour oil-fired boilers with associated auxiliaries, pipework, switchgear, cables, etc.

Applicants should be Corporate Members of either the Institution of Mechanical Engineers or the Institution of Electrical Engineers, and should have had previous experience of power station construction work.

The salary of the post will be £2,250 per annum and the appointment will be for a period of eighteen months in the first instance.

The successful candidate will be required to take up his duties in Cyprus immediately.

Quarters with heavy furniture will be provided by the Authority, who will also provide such local transport as is necessary for the work, but this will not be available for private purposes.

First class passages up to a maximum of three will be paid from England to Cyprus at the commencement of duty for the successful applicant and his family, and also from Cyprus to England on satisfactory completion of the engagement. Air travel may be necessary at the option of the Authority.

The selected candidate will be required to pass a medical examination.

Leave with pay at the rate of 2½ days per completed month of residential service will be granted after the completion of an eighteen-month tour of duty.

Applications giving age, qualifications and experience should be addressed to:

Messrs. Preece, Cardew & Rider,
8-12, Queen Anne's Gate,
Westminster, S.W.1,

within fourteen days of the appearance of this advertisement. 4578

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Central Gloucestershire Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER (Dean Forest District).

Experience necessary in all branches of distribution work, including construction, maintenance and operation of high and low-voltage systems and substations, and the planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary £835/£880 per annum (N.J.B. Grade E.7). Previous applicants need not re-apply.

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER (Dean Forest District).

Applicants should have had wide practical experience in the sale and installation of domestic and commercial electrical equipment and the work associated therewith. The successful applicant will be required to assist in all branches of commercial work, including advising consumers on domestic, commercial and industrial equipment, estimating, contracting work and public lighting. Technical qualifications desirable. Salary £685/£730 per annum (N.J.B. Grade E.10). Previous applicants need not re-apply.

Apply by letter within 14 days, stating age, experience, present position and salary, to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126, London Rd., Gloucester.

North Staffs Sub-Area

DISTRICT ENGINEER (Newcastle District).

Applicants should have had a sound technical training and extensive experience in the construction, operation and maintenance of high-voltage and low-voltage distribution networks and associated switchgear, transformers and protective systems. Technical qualifications desirable. Salary £1,065/£1,140 per annum (N.J.B. Grade E.3).

Apply by letter within 14 days, stating age, qualifications, experience, present salary and position, to Mr. C. C. Pimble, Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

A. STEPHENS,
Secretary. 4617

LONDON ELECTRICITY BOARD

General Assistant Engineer

APPLICATIONS are invited for the above position. Initially the successful candidate will be located at Lithos Road, Hampstead, London, N.W.3.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the electricity industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the post within the National Joint Board Agreement, the provisional minimum salary will be £590 per annum rising to £725 per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 8th September, 1958. Please quote ref. PER/2517/R. This announcement is an amended version of that appearing in the "Electrical Review" of 22nd August, 1958, under the same reference, and applicants for that post will automatically be considered and need not re-apply. 4609

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

Research and Development Department

APPLICATIONS are invited for the post of DIRECTOR OF DEVELOPMENT PROJECTS (Electrical) in the Research and Development Department of the Central Electricity Generating Board at Headquarters, London, S.E.1. The successful candidate will be responsible to the Chief Research and Development Officer for the economic assessment, initiation and headquarters supervision of development projects in the fields of electrical equipment, transmission and system control undertaken both at out-stations and at the Board's Laboratories.

This is a senior appointment requiring wide experience of research or project direction in the fields of physics or electrical engineering. Previous experience in the heavy electrical supply or manufacturing industries would be an advantage but is not essential.

Candidates should have a good honours degree in science or engineering, or equivalent qualification.

Salary will be on a scale within the range of £2,960 to £3,860 p.a. according to the agreed duties and responsibilities of the post.

Letters of application stating age, qualifications and experience, present position and salary should be forwarded to S. S. Scott, Chief Personnel Officer, Buchanan House, 24-30, Holborn, London, E.C.1, by 8th September. Please mark envelopes "Confidential," Ref. ER/225. 4592

A.E.I.—JOHN THOMPSON NUCLEAR ENERGY CO. LTD.

Radbroke Hall, Knutsford, Cheshire

Senior Commissioning Engineer

A SENIOR COMMISSIONING ENGINEER is required by the above company for its nuclear power station commissioning programme. Considerable responsibility is involved and only applicants who have had wide experience in power station operation, preferably as superintendent or deputy superintendent, should apply. The work will consist of taking charge on site of the commissioning teams and carrying out the agreed procedure for setting the station to work, together with responsibility for running the plant until such time as it is finally handed over to the client. Applicants should be qualified engineers, a university degree or equivalent being essential. Training in nuclear engineering will be arranged.

The offices are situated at Knutsford. The position is a permanent staff appointment, and a contributory pension scheme is in operation. Transfer of existing C.E.G.B. pension rights can be arranged.

Apply in writing, giving age, experience, qualifications and present salary, to the Chief Engineer, quoting reference COM/STF.

4577

LAMP MAKING ENGINEER

required at the Development Laboratory, ATLAS LIGHTING LTD.

with experience of the design and testing of projector lamps.

Apply to LED/WJM,

ATLAS LIGHTING LTD.
Angel Factory Colony, Angel Road, Edmonton, London, N.16.

4619

THE NIGERIAN RAILWAY CORPORATION

invites applications for the following post :—

ASSISTANT ELECTRICAL ENGINEER.

Duties: An Assistant Electrical Engineer will be required to take charge of minor capital works projects on the railway, responsible to the Electrical Engineer.

Qualifications: Candidates should have experience of planning, construction and commissioning of (a) small diesel-engined power stations; (b) High-tension and low-tension distribution schemes with both overhead and underground systems; (c) Workshop lighting and power schemes; (d) Conduit wiring systems; (e) Railway yard floodlighting schemes. A knowledge of water supply systems would be an advantage. They should preferably be Associate Members of the Institution of Electrical Engineers or possess a degree recognised as granting exemption from Parts I and II of the Institution of Electrical Engineers' examination and have five years' suitable experience.

Salary: In scale £1,100 × £50 per annum to £1,900 (inclusive of overseas pay). Starting salary according to qualifications and experience. Appointments on contract will have a gratuity payable on completion at the rate of £18 6s. 8d. to £31 13s. 4d. for each completed month of service.

Tours: 15 months in Nigeria followed by 15 weeks' leave on full pay.

Quarters: Partly furnished quarters are provided at low rental.

Allowances: There are attractive family, travelling, transport and other allowances.

Send postcard before 30th September, 1958, mentioning the post and this paper for further particulars and application form to :—

The London Representative,
Nigerian Railway Corporation.
Nigeria House, 9, Northumberland Avenue, London, W.C.2.

4627

JOSEPH LUCAS

(ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

BOROUGH OF WIDNES

Borough Engineer and Surveyor's Department

APPLICATIONS invited for the post of PUBLIC LIGHTING SUPERINTENDENT Grade A.P.T. III (£845-£1,025).

N.J.C. conditions, superannuation scheme, medical examination. Housing accommodation if required.

Applicants must possess the Final Examination in Illuminating Engineering of the City and Guilds of London Institute and/or Ordinary National Certificate in Electrical Engineering. Preference will be given to Corporate Members of the Association of Public Lighting Engineers.

Applications, together with names and addresses of two referees, to the Borough Engineer, Town Hall, Widnes, by first post on 8th September, 1958.

FRANK HOWARTH,
Town Clerk.

Town Hall,
Widnes.
July, 1958. 4608

ENGINEERING CADET EXECUTIVES

The Ahmedabad Electricity Co. Ltd.
The Surat Electricity Co. Ltd.
Bombay Suburban Electric Supply Ltd.

APPLICATIONS are invited from Indian Nationals for appointment as CADET EXECUTIVES in the Electricity Undertaking managed by Messrs. Killick Industries Limited, of Bombay, India.

Candidates must be graduates in electrical or mechanical engineering, preferably being not less than a graduate member of one of the major engineering institutions, and should have had at least two years' practical experience. Age not above 30.

Selected candidates will be under special training for a period of not less than 3 years, during which time they will be in receipt of a basic salary of Rs. 500/- per month, with annual increments of Rs. 35/-. House and travelling allowances will be paid, as also dearness allowance as applicable from time to time. (Cadets will qualify for P.F. benefits after six months from the date of joining). After satisfactory completion of training, cadets will be eligible for appointment to responsible covenanted posts in the undertakings.

Applications stating age, qualifications, experience, etc., should be forwarded in duplicate to Messrs. Baldwin & White, 16/17, Devonshire Square, London, E.C.2, and marked "CADET EXECUTIVE" on the envelope.

4537

ELECTRICITY AUTHORITY OF JAMAICA

APPLICATIONS are invited for the post of GENERAL MANAGER AND CHIEF ENGINEER. The appointment is non-pensionable and will be for a period of three years in the first instance. Salary according to qualifications and experience up to £3,500 a year with gratuity at the rate of 20% of total salary received on satisfactory completion of contract. Rental subsidy up to £300 a year. Free passages for officer and wife, also children below 18 years of age, unmarried, and dependent upon him, not exceeding five persons in all. Liberal leave on full salary.

Candidates must be Members of the Institution of Electrical Engineers.

In addition to generation and transmission techniques, the position demands up-to-date knowledge and practical experience of the economical and successful electrification of rural and semi-rural areas, including organisational principles, public, consumer and employee relations, tariffs, commercial practice and general administration. The possession of these qualifications combined with enthusiasm for electrification and the ability to produce results is of greater importance than age.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/50264/EF. 4626

SOUTH OF SCOTLAND ELECTRICITY BOARD

Fife Area

District Commercial Engineer

APPLICATIONS are invited for the post of DISTRICT COMMERCIAL ENGINEER in the Eastern District centred on Cupar, Fife.

Cupar is a pleasant market town of 5,500 inhabitants with good educational facilities.

Applicants should have experience of both system operation and commercial work and should hold an engineering qualification.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A, Classification and Grading F.3. Salary £1,160/£1,235 per annum.

The successful applicant will be expected to live within reasonable distance of Cupar and to take his part in the social life of the town and countryside.

Applications on the standard form, obtainable from the undersigned or any other Area Manager, should be submitted not later than Friday, 5th September, 1958, to East Port, Dunfermline.

G. T. ALLCOCK,
Area Manager.

4625

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. for post (a) and Corporate Membership for post (b) an advantage.

(b) SHIFT CHARGE ENGINEER, BANKSIDE POWER STATION (Vacancy No. 58/646).

Practical experience in operation of power station essential with experience of high-pressure plant an advantage. Character and ability to deal with staff problems essential. Salary Class H, Grade 6 = £1,115 plus £106 10s. shift per annum.

(a) ASSISTANT MAINTENANCE ENGINEER (Instruments), BELVEDERE POWER STATION (Vacancy No. 58/647).

Candidates should preferably possess H.N.C. but must have had sound technical training and good practical knowledge of construction, repair and testing of power station instruments and automatic controls, also ability to plan in detail and control labour. Salary Class L, Grade 10 = £1,045 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 8th September, 1958. 4596

REPUTABLE AND OLD-ESTABLISHED WEST OF ENGLAND ENGINEERING COMPANY

now developing and projecting its interests into the electrical contracting industry seeks well-qualified and experienced MANAGER to control and direct its development in this field and to establish an organisation for the design and installation of all forms of industrial, commercial and domestic electrical work.

A progressive and key post is available with immediate entry into superannuation scheme. Qualifications as a Chartered Electrical Engineer are desirable. All applications will be treated with utmost confidence and must give details of qualifications and experience, age and salary requirements.

Write to Bevan Hancock & Co., 25, Baldwin Street, Bristol, 1, marking envelope "Electrical."

4597

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Division

Steam Testing Department

APPLICATIONS are invited for the appointment of a SECOND ASSISTANT ENGINEER in the Steam Testing Department with headquarters at Dunston, to control a small section investigating the thermal performance and operating characteristics of a wide variety of modern steam plant. The work demands considerable initiative, and offers experience of testing techniques in an interesting field.

Applicants should be Corporate Members of the Institution of Mechanical or Electrical Engineers, and should have previous plant testing experience. A knowledge of power station operation will be considered an advantage.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Schedule B, Grade 4 (£1,145-£1,375) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from any office of the Generating Board, or from Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 1st October, 1958. 4614

CYPRUS INLAND TELECOMMUNICATIONS AUTHORITY

TELECOMMUNICATIONS EXECUTIVE ENGINEER required by the Authority on contract for two or three tours in the first instance, of 21-24 months each. Salary in scale (including present temporary allowance of 25% of salary) £2,000 rising to £2,312 a year. Gratuity at rate of £150 a year. Alternatively permanent and pensionable terms may be arranged. Existing civil servants' pension rights can often be preserved. Particularly well qualified and/or experienced candidates considered for higher salary scale. Outfit allowance of £30. Free passages and furnished quarters. Liberal leave on full salary.

Candidates must hold C. and G. Full Technological Cert. or equivalent, have at least 10 years' executive engineering experience in construction and maintenance of 2,000-type non-director automatic exchanges, V.H.F. multi-channel, carrier and V.F. telegraph equipment, and other duties of a general nature associated with running of a telecommunications section.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/42675/EF. 4594

TECHNICAL INSTRUCTOR (ELECTRICIAN)

required by GOVERNMENT OF NORTHERN REGION, NIGERIA, for two tours of 18/24 months or three tours of 10/12 months, either (a) on agreement with prospect of permanent and pensionable employment in salary scale (including inducement addition) £750 rising to £1,284 a year, or (b) on contract in salary scale (including inducement addition) £810 rising to £1,386 a year, with resettlement grant at rate of £100/£150 a year. Commencing salary generously assessed according to age, qualifications and experience. Clothing allowance £45. Free passages for officer and wife. Assistance towards cost of children's passages and grant up to £288 annually. Liberal leave on full salary.

Candidates must have served full apprenticeship and possess Final C. & G. Certificate. They must be practical tradesmen with experience of domestic installation work and the installation and maintenance of generating units. Apprenticeship training or other teaching experience desirable.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/41933/EF. 4587

JOSEPH LUCAS (ELECTRICAL) LIMITED

ASSISTANT ELECTRICAL DESIGN ENGINEER

required for the design of rotating electrical machines and electro-magnetic devices. Projects will include fundamental design investigations, and full scope will be given for initiative and imagination.

The post is permanent and pensionable.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/221.

125

RUBBER IMPROVEMENT LTD. WELLINGBOROUGH

require an ELECTRICAL AND INSTRUMENT ENGINEER who must have a wide knowledge and practical experience of electrical and control instruments employed on rubber and plastics manufacturing machinery of all kinds.

The appointment carries a good salary, and a non-contributory staff pension and life insurance scheme is in operation.

Applications, which will be treated in strict confidence, should be addressed to the Secretary. 4611

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments in this Division:—

ASSISTANT SHIFT CHARGE ENGINEER, TIR JOHN POWER STATION, PORT TENNANT, SWANSEA (Vacancy No. 82/ER/58).

Salary H.9, £885-£930 per annum.

H.N.C. or equivalent and experience in a modern generating station essential.

ASSISTANT MAINTENANCE ENGINEER (Electrical), NEWPORT POWER STATION (Vacancy No. 83/ER/58).

Salary F.8, £835-£880 per annum.

Applicants should have had wide experience in power station electrical maintenance and possess H.N.C. or equivalent qualifications.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 12th September, 1958. 4616

A.E.I.—JOHN THOMPSON NUCLEAR ENERGY CO. LTD.

Radbroke Hall, Knutsford, Cheshire

Shift Commissioning Engineers

SHIFT COMMISSIONING ENGINEERS are required by the above company for nuclear power stations. The work will involve taking charge of a shift during the commissioning and proving phase. Applicants should preferably have had previous experience as shift charge engineer or assistant shift charge engineer in a modern power station. Training in nuclear engineering will be arranged. Applicants should be qualified engineers, a degree or membership of one of the senior engineering institutions being essential.

The offices are situated at Knutsford. The position is a permanent staff appointment, and a contributory pension scheme is in operation.

Apply in writing, giving age, experience, qualifications and present salary (which will be treated in strict confidence), to the Chief Engineer, quoting reference COM/STF.

4576

HARRIS COLLEGE, PRESTON

Principal: H. Wilkinson, M.Sc.Tech., Ph.D., A.Inst.P.

REQUIRED for ELECTRICAL ENGINEERING DEPARTMENT:—

(a) SENIOR LECTURER to teach to I.E.E. Part III level, with Honours Degree in Electrical Engineering and Corporate Membership of I.E.E. Opportunity for development for candidate having special interest in Electronics and/or Control Systems. Salary £1,350 to £1,550. Point of entry dependent on previous experience and/or industrial experience.

(b) ASSISTANT LECTURER, GRADE A, with Degree in Electrical Engineering or equivalent, and industrial and/or teaching experience, to teach National Certificate subjects, including Radio Theory if possible. Salary £475 to £900. Point of entry dependent on qualifications and previous teaching and/or industrial experience.

Details from Principal.

W. R. TUSON
Clerk to the Harris Council.

4628

ASSISTANT ELECTRICAL ENGINEER

ELECTRIC motor control gear manufacturers require young Assistant in Design Office with knowledge of electronics. Progressive position, contributory pension scheme.—Box 4496.

Situations Vacant (continued)

LOUGHBOROUGH COLLEGE OF TECHNOLOGY

APPLICATIONS are invited for the positions of SENIOR LECTURER in Electrical Engineering, and LECTURER in Electrical Engineering.

Applicants should be fully qualified electrical engineers having experience or special interest in one or more of the following branches :—

Electrical measurement.
High-voltage techniques.
Utilisation of electrical power.
Electrical plant.

Commencing salaries will be determined by previous educational and industrial experience, and will be within the scale :—

Senior Lecturer : £1,350 × £50 to £1,550 p.a.
Lecturer : £1,200 × £30 to £1,350 p.a.

Both research and collaboration with industry are encouraged.

Further particulars and forms of application may be obtained from the Registrar. (In reply please quote 27/AE.) 4586

CITY OF NOTTINGHAM

Lighting Department

APPLICATIONS are invited for the appointment of DEPUTY LIGHTING ENGINEER GRADE IV (£1,025/£1,175).

Candidates should have a sound knowledge of the design, installation and maintenance of all types of public lighting, be capable administrators, and should preferably have a knowledge of Local Government procedure.

The appointment, which is pensionable, will be subject to the National Scheme of Conditions of Service, and to the successful applicant passing satisfactorily a medical examination.

Applications stating age, education, training, experience and qualifications, together with the names of two persons to whom reference may be made, should be forwarded to the undersigned not later than 20th September, 1958.

T. J. OWEN,
Town Clerk.

The Guildhall,
Nottingham. 4580

ESTIMATOR FOR ELECTRICAL ENGINEERING

ESTABLISHED manufacturers of special-purpose rotating machines and control gear (A.C. and D.C. up to 300 kW) need an estimating engineer with some mechanical, but mainly electrical, experience. He will lead this activity in the company and must therefore be a qualified and responsible engineer able, when necessary, to represent the company in price negotiation matters.

Senior staff conditions apply and prospects are attractive. Applications addressed to Commercial Manager will be treated most confidentially; they should include age and salary indication with career details.

VERNONS INDUSTRIES LTD.
Kirkby Industrial Estate, Liverpool.

4622

HARLOW DEVELOPMENT CORPORATION

Technical Assistant (Electrical) : Salary £753-£939 per annum

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT (Electrical) who must be experienced in electrical contracting and preferably have been a chargehand or foreman on public buildings, housing and factories. He should be conversant with the regulations for electrical equipment in building and the Electrical (Factories Act) Regulations. Duties will include office work in the preparation of schemes and supervision of electrical installation in industrial buildings. Candidates should possess the Higher National Certificate in Electrical Engineering.

Dwelling accommodation in suitable cases.

Applications, giving full details and names of referees, to the General Manager, Terlings, Harlow, Essex, within 10 days. 4579

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Staff Vacancy Notice

Headquarters

THIRD ASSISTANT ENGINEER (Industrial Development) required in the Chief Commercial Officer's Department, Board Headquarters.

Salary within the range £895/£1,110 per annum, N.J.B. scale AX/DX6.

Duties of the post will be to assist in many aspects of industrial development.

Knowledge of contracting techniques and materials and the design of lighting and heating installations would be an advantage.

Appropriate technical qualifications essential.

Applications on special forms obtainable from the Establishments Officer, Merseyside and North Wales Electricity Board, Love Lane, Pall Mall, Liverpool, 3, should be submitted to him by the 10th September, 1958. 4621

SOUTH EASTERN ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER (Operation and Maintenance), Surrey Sub-Area Headquarters, Dorking.

Salary £835-£880 per annum in accordance with N.J.B. Class L, Grade 13. Superannuable. Applicants of at least H.N.C. standard should have had a sound training in electrical distribution. Duties will chiefly consist of assisting in plant maintenance and the testing and commissioning of system protection. A knowledge of, or interest in, the latter would be an advantage.

Applications naming two referees, on forms from Surrey Manager, SEEBOARD, Rough Rew, Ridgeway Road, Dorking, Surrey, by 10th September, 1958.

G. WRAY,
Secretary.

4623

SENIOR ELECTRICAL DRAUGHTSMAN

MONSANTO CHEMICALS LIMITED, London, require a SENIOR ELECTRICAL DRAUGHTSMAN with experience of power, lighting and control installations in the chemical manufacturing or similar industries.

Applicants, preferably with H.N.C. and practical background in electrical engineering, should be able to work on own initiative.

The post is permanent and a good salary will be paid commensurate with qualifications and/or experience. 5-day week, staff restaurant and non-contributory pension scheme are in operation.

Applications in writing, giving full details of age, training, qualifications and experience, should be sent to DLO85, Monsanto Chemicals Limited, Monsanto House, 10/18, Victoria Street, London, S.W.1. 4589

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

Transistor Circuits Research

OPPORTUNITY for honours graduate to choose own line of research within wide limits in research into circuit techniques using transistors and other solid state devices with emphasis on performance not achieved with thermionic valves.

Appointment at P.S.O./S.S.O. level (research experience essential) at salary in range £1,215-£2,080, or at S.O. level at salary in range £645-£1,120.

Send POSTCARD to Group Recruitment Officer (1158Y/48), A.E.R.E., Harwell, Didcot, Berks., for application form. 4588

B I C C

PHYSICIST or ELECTRICAL ENGINEER, graduate preferably of honours degree standard, required for the Shepherds Bush research laboratories of BRITISH INSULATED CALLENDER'S CABLES LTD. The work involves research and development on dielectrics and capacitors. Previous experience in this field would be desirable but is not essential.

Five-day week; pension fund.

Applications giving details of age, qualifications and experience to be made to Personnel Officer, B I C C Ltd., 38, Wood Lane, London, W.12. 4610

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

ELECTRICAL FITTER AND HANDYMAN required for automatic and electronically operated boiler plant at new office building near Paddington station. Responsible for electrical and mechanical services operational maintenanec. Salary £11 9s. a week, for a 44-hour week. Pension scheme.

Apply immediately to the undersigned at 11a, Portland Place, London, W.1, giving age, present appointment and previous experience, with the names and addresses of two professional referees.

E. G. BRAITHWAITE,
Secretary.

4618

JUNIOR DEMONSTRATORS

TRICITY COOKERS Ltd. invite applications from JUNIOR DEMONSTRATORS with some cooker selling experience to work in areas centred on Birmingham, Bristol and Newcastle-on-Tyne.

Salary according to experience. Expenses and pension facilities.

These are progressive openings for keen young ladies.

Write to 109, Kingsway, London, W.C.2, giving age and details of education and experience. 4581

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division
Vacancy No. 81/ER/58

APPLICATIONS invited for the superannuable appointment of SHIFT CHARGE ENGINEER, LLANELLY POWER STATION.

Salary E.7, £835-£880 per annum.

Appropriate engineering qualifications and regular apprenticeship desirable.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 10th September, 1958. 4595

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

SHIFT CHARGE ENGINEER required at Newton Abbot Power Station. Superannuation scheme. Salary N.J.B. Class F, Grade 7, £885-£930 plus 10% shift allowance.

Applicants should have had considerable experience in modern power station operation.

Qualifications leading to graduate or corporate membership of a recognised engineering institution or equivalent desirable.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Rd., Bristol, 8, should be completed and returned by 4th September, 1958. 4615

ELECTRICAL DESIGNER

APPLICATIONS are invited for an ELECTRICAL DESIGNER with experience in the design of A.C. motors up to 3.3 kV.

This is a permanent post, also offering excellent experience and varied work other than machine design to man who is capable of accepting responsibility and working with minimum supervision.

Salary commensurate with experience and technical qualifications.

Box 4486.

TRANSFORMERS (WATFORD) LIMITED

require

EXPERIENCED SENIOR TRANSFORMER DRAUGHTSMAN.

Permanent and progressive position.

Apply :
Chief Draughtsman, Transformers (Watford) Ltd., Sandown Road, Watford.

4524

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

APPLICATIONS are invited for the post of ASSISTANT ENGINEER in the Electrical and Mechanical Engineering Department of the Board's Head Office in Edinburgh. Applicants should have a sound technical education and be capable of dealing with matters of technical design and investigation and generating station planning and operation.

Salary commencing at a point within the range £1,055-£1,250 (N.J.B. Schedule B, Class AX/CX, Grade 5). Depending on experience and qualifications. Superannuation scheme.

Application form obtainable from The Secretary, 16, Rothesay Terrace, Edinburgh, 3, should be returned within 21 days from the date of this advertisement. 4624

INTERNATIONAL SYNTHETIC RUBBER CO. LTD.

Secure employment in a new factory is offered to

INSTRUMENT MECHANICS

available to work shifts. Applications from persons who have had experience in the chemical industry especially welcome.

Generous sickness payment and superannuation schemes. Subsistence payable until houses become available in about twelve months' time. This is a unique opportunity to settle your home in the lovely New Forest area.

Apply giving full particulars of age, experience, etc., to the Labour Officer of the Company at Hythe, Hants. 4630

SALES MANAGER

WELL-known electrical accessory manufacturer with works in the North West, has a vacancy for an experienced Sales Manager. A man of proved organising ability, sales initiative and drive will receive a generous salary. Persons who hold similar positions in similar electrical industries and have a reasonable technical background should apply, in confidence, to the Managing Director, Box 4551.

LANCASHIRE ELECTRIC LAMP FACTORY

employing most modern equipment requires

TECHNICAL ADMINISTRATIVE and PRODUCTION STAFF and REPRESENTATIVES.

Write in strictest confidence to Box 4629.

AN organisation comprising a group of companies engaged in the manufacture of heating and air conditioning equipment requires the services of a fully qualified electrical engineer (M.I.E.E.) to develop the sales, design and contracting for electrical installations. The post offers wide scope and prospects. Write stating age, qualifications and salary required to Box 4598. All applications will be treated in strict confidence.

ASSISTANT electrical engineer with sound technical training and practical experience, a good knowledge of heavy electrical equipment, control schemes and cabling, required for large integrated iron and steel works in North Lincs. Age preferably not over 35. Reply giving full details of education, training and experience to the Chief Engineer, Appleby-Frodingham Steel Company, Scunthorpe, Lincs. 4564

ASSISTANT general manager required by Midland electrical contractors with number of branches. Must have experience of estimating, and ability to organise and control staff. State experience, previous appointments and salary required to—Box 4632.

ASSISTANT manager required for progressive firm of electrical contractors on the S.E. Coast. Age under 40. Experience in costing and electrical specifications and capable of running small office. Salary according to capabilities. Applicants should write stating age and details of experience to—Box 9460.

CONTROL gear engineer required, age 23-35, for layout and circuiting of contactor equipment. Good salary. Permanent and progressive position. Canteen, pension scheme. Write stating age, experience and qualifications, if any, to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 273

CABLE makers (independent) require fully qualified works manager with comprehensive knowledge of electric cable making in all phases with emphasis on low tension. Possibility of employment overseas. All applications will be treated in strict confidence.—Box 4501.

CHARGEHAND and foreman electricians required for service in East Africa. Opportunity for permanency if desired. Must be experienced in all types of electrical installations. Write stating age and experience.—Box 4540.

CIVIL engineer required for railway traction contract in Glasgow. Considerable experience in the execution of foundations for supporting structures necessary. The position offers excellent opportunities in a new and interesting field and the salary will be commensurate with responsibilities. Applications giving qualifications and experience to The Manager, Overhead Lines Department (Traction), Pirelli-General Cable Works, Ltd., Eastleigh, Hants. 4620

DESIGN development. Senior engineer required by well-known manufacturer of rotating electrical machines. A vacancy with opportunity for a man with ability and experience in the field of electrical engineering design. Submit experience, age, etc., to—Box 4565.

DRAKE & GORHAM (CONTRACTORS) Ltd. have a vacancy for a senior estimating engineer to act as assistant to the manager of the department in London. Applicants should write, stating details of experience, age and salary expected, to—36, Grosvenor Gardens, London, S.W.1. 4602

DRAKE & GORHAM (CONTRACTORS) Ltd. have a vacancy for a senior supervising engineer to act as group leader in London. Applicants should write, stating details of experience, age and salary expected, to—36, Grosvenor Gardens, London, S.W.1. 4603

DRAKE & GORHAM (CONTRACTORS) Ltd. have a vacancy for a supervising engineer to assist the manager at their Cardiff office. Applicants should write stating age, details of experience and salary expected to—36, Grosvenor Gardens, London, S.W.1. 4458

DRAUGHTSMEN, both senior and junior, required. Applicants should have either contract development or diagram experience on switchgear up to 11 kV, although men with good electrical or mechanical knowledge will be considered. Excellent working conditions. Good prospects. 5-day week. Superannuation fund. Interviews arranged Saturdays if desired. Apply giving full details of training and experience to—Personnel Officer, Crompton Parkinson (Chelmsford) Limited, Chelmsford, Essex. 389

ELECTRICAL engineer, preferably graduate, 25/30, required for technical work in connection with tenders for generating plant, switchgear and control boards. Must be able to prepare circuit diagrams relating to automatic control of engine-driven generating plant. This is an interesting technical appointment offering ample scope for ingenuity and original approach whilst providing an excellent opportunity for advancement with an expanding and progressive organisation situated in the South of England. Write quoting previous experience, technical training, age and salary required to Managing Director.—Box 4568.

ELECTRICAL engineer to act as senior assistant to chief draughtsman of drawing office of large shipbuilding establishment. Experience must include design of installations for merchant and Admiralty vessels, and ordering of equipment. Estimating experience advantageous. Salary and condition of employment will be attractive to the successful candidate. Candidates should state in their applications their present degree of responsibility.—Box 4601

ELECTRICAL mechanic, Lister diesel plant certificate and able to repair domestic washing machines and equipment, to take charge of department; able to drive. Full details, age, experience and salary required. Southern Counties electrical contractors.—Box 4633.

ELECTRICAL wholesalers require representatives; all areas; experience in the electrical trade essential.—Universal Distributing Co. Ltd., 66/68, Great Eastern Street, London, E.C.2 (Phone, SHOreditch 8282). 4505

ESTIMATOR required capable of estimating for all types of diesel and petrol generating plants up to 200 kVA. Applicant must be familiar with all makes of engines and generators and able to put forward own suggestions. Attractive locality. Works situated within ½ mile of sea.—Managing Director, Dale Electric (Yorkshire) Ltd., Filey, Yorkshire. 4526

ESTIMATING engineers, to take off quantities, are required by old-established electrical contractors for employment in their London estimating department. Applicants should write, giving details of experience, age and salary expected, to—Box 4604.

ESTIMATOR required for N.W. London firm of contractors; experienced in industrial and council installations. Apply giving age, salary required and details of experience. —Box 4374.

GRADUATE electrical engineer. A young man is required for post of unusual opportunity with a manufacturer of electrical equipment. Applicants should preferably have both manufacturing and design experience. Character and enthusiasm are essential. Give fullest details to—Box 4566.

INTERESTING and progressive position offered to young man able to work on his own in the sales department of an electrical engineering concern in N.W. London. Duties would include preparation of complete quotations of specialised electrical equipment and some customer liaison. Sound electrical knowledge essential. O.N.C. an advantage.—Box 4541.

JUNIOR electrical engineers required by electrical department of Huntington, Heberlein & Co. Ltd., Simon House, 28-29, Dover Street, London, W.1, capable of preparing schemes, specifications, estimates and general engineering of contracts. Applicants should have experience of heavy industrial electrical equipment, including switchgear, automatic control gear, cabling and installation. 5-day week, luncheon vouchers, 3 weeks' holiday, and pension scheme. Applications to be addressed to Staff Department. 4582

KEEN young draughtsman with machine shop training required for small production drawing office of company engaged in the manufacture of control gear equipment. Electromechanical experience desirable but not essential. Permanent and progressive position. 5-day week, pension scheme, canteen, etc. Apply giving full details of age and previous experience to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middx. 278

LIGHTING engineer required for sale of "Thorlux" industrial lighting equipment for the London area. Previous sales experience with connection essential. Contributory pension scheme and car provided. Write stating age and salary required. All applications treated in strict confidence.—F. W. Thorpe Ltd., Welby Road, Hall Green, Birmingham. 4567

MANUFACTURERS of contactor motor control equipment require sales engineer in South Wales. A suitably trained young man with O.N.C. minimum technical qualifications, and with preferably, but not essentially, connections covering mainly industrial users, could make this appointment an attractive career.—Box 4591.

MOTOR control and contactor gear manufacturer in Midlands requires capable and experienced designer in M.V. range. Excellent opportunity for right man. State qualifications, salary and experience, in confidence, to—Box 4497.

N.S.F. Ltd. have vacancies in their expanding sales force for area sales engineers with experience in the electronic and light electrical component industries. Applications should be made by letter only, giving full details of experience, age and qualifications, if any, to—Sales Manager, 31-32, Alfred Place, London, W.C.1. 4612

PAKISTAN. The General Electric Co. Ltd. has a vacancy for a site electrical foreman for various constructional projects in Pakistan. A wide experience in the supervision of electrical contracting work is essential. Applicants should write to Staff Manager, Magnet House, Kingsway, London, W.C.2, Ref. SF, giving details of age and experience. 4599

REPRESENTATIVE required for E.W.F. wholesalers to take over established connection West London area. Must have knowledge of the trade but previous travelling experience not necessary; well paid position with good prospects. Reply in confidence with full details of experience, etc., to Managing Director. —Box 4635.

SUPERVISING engineers are required by large electrical contractors to undertake supervision of contract work, operating from London. Applicants should write, stating full details of experience, enclosing copies of any references available, giving age and salary expected, to—Box 4605.

***Situations Vacant** (continued)*

REPRESENTATIVE required by London electrical wholesalers. Should have own transport. Good prospects.—Box 4634.

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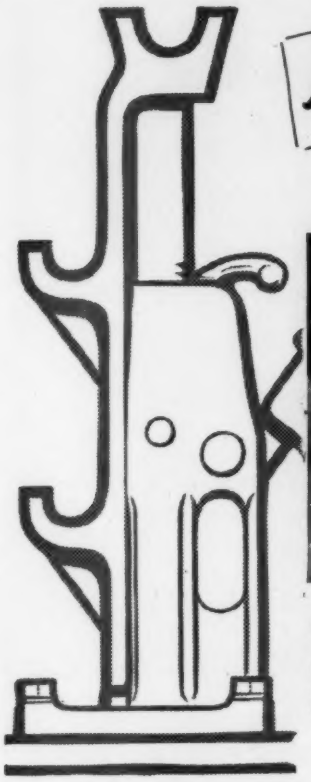

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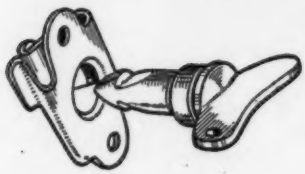

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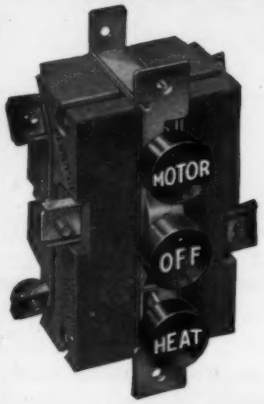

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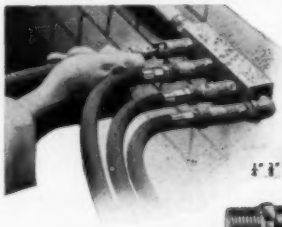

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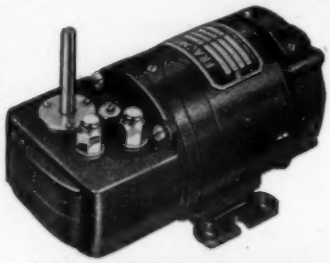

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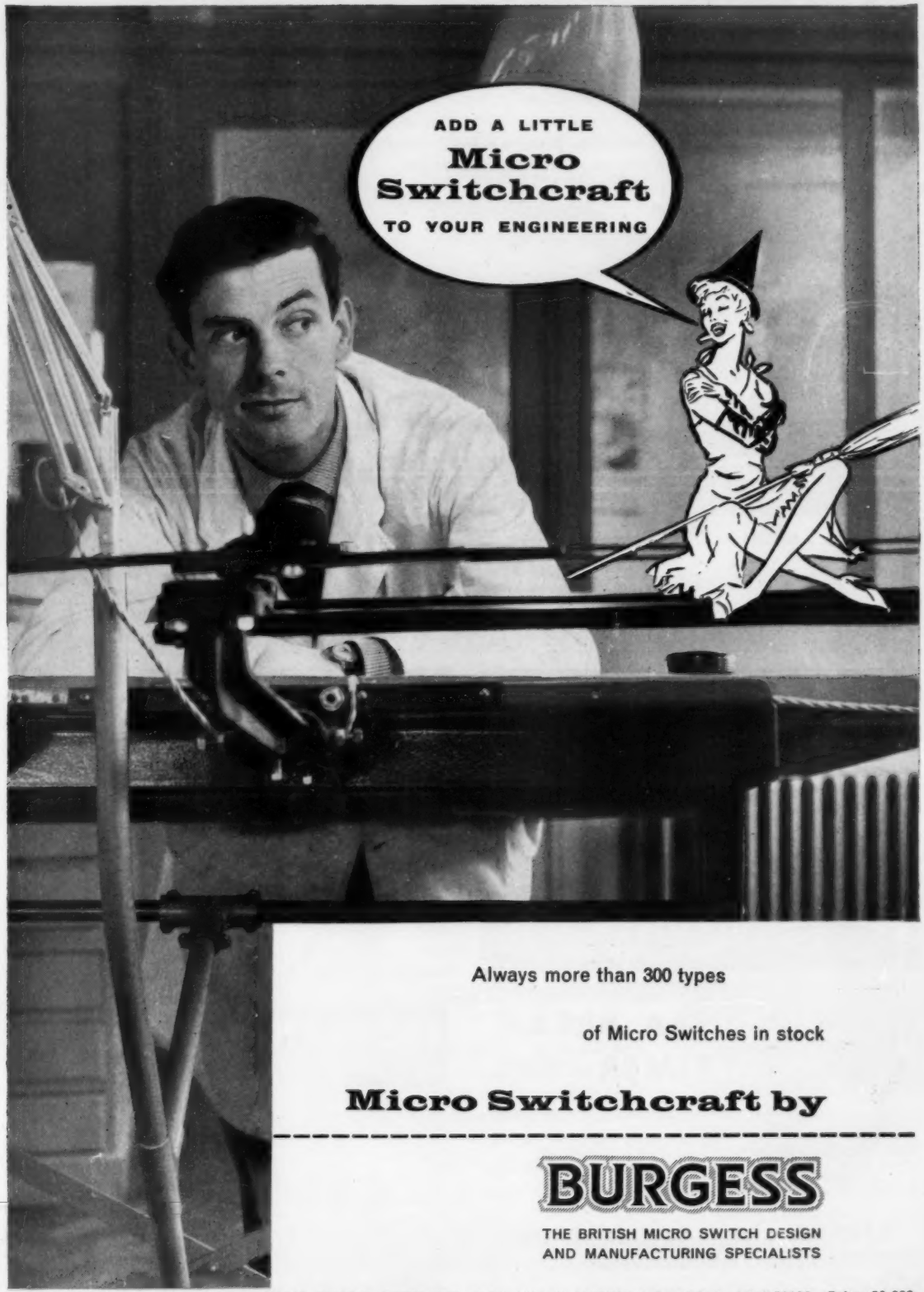

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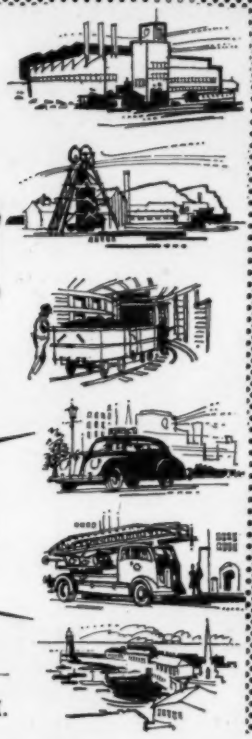

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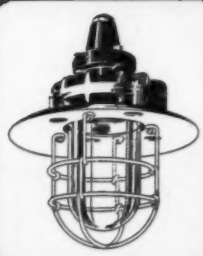

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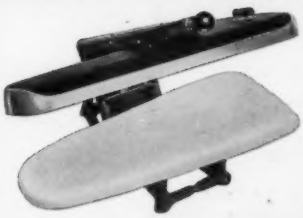

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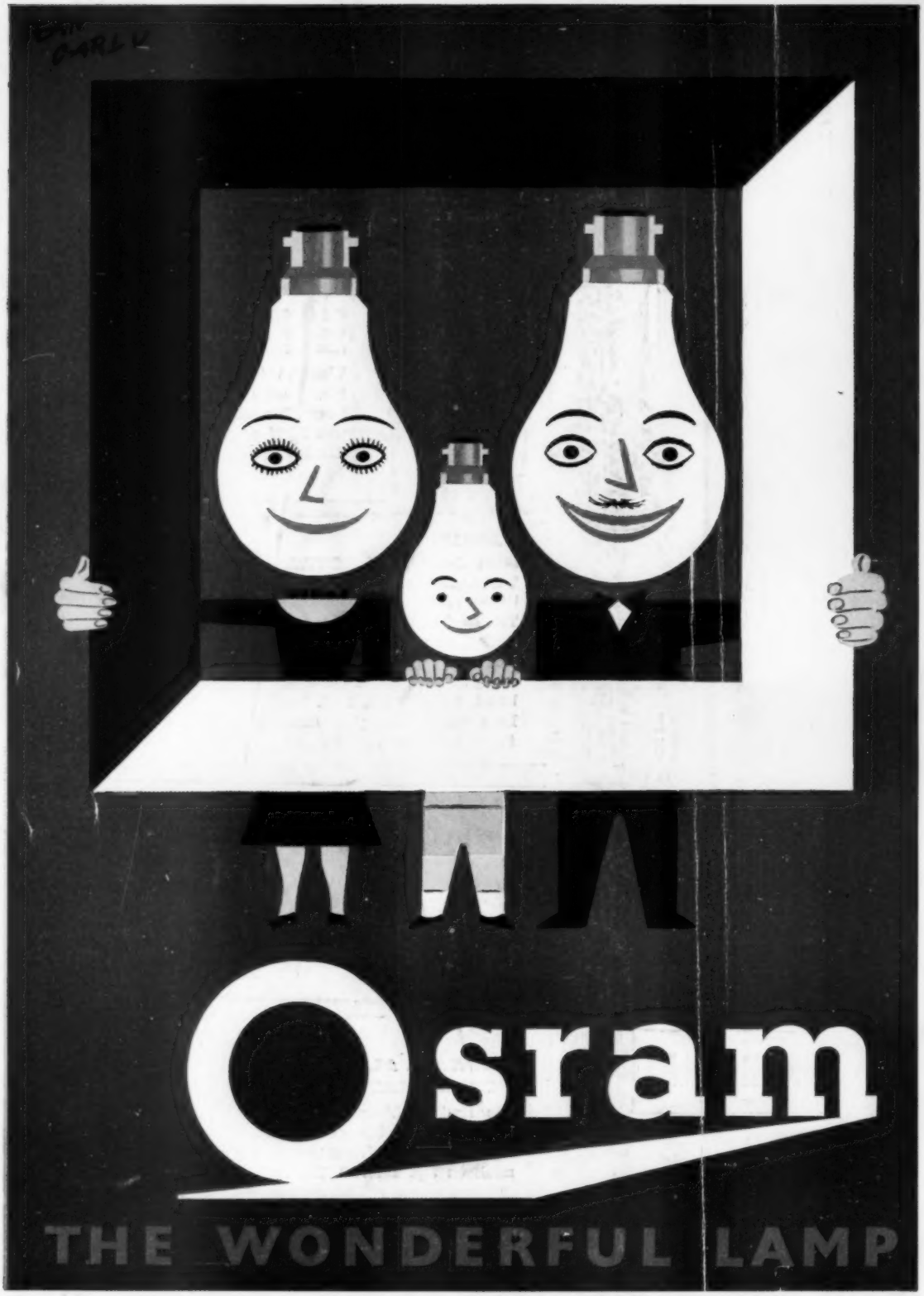
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